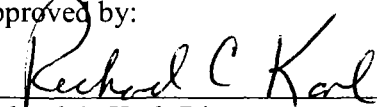


**Five-Year Review Report**  
**Third Five-Year Review Report**  
**for**  
**Windom Municipal Dump**  
**City of Windom**  
**Cottonwood County, Minnesota**  
**February 2005**

**Prepared By:**

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Approved by:

  
Richard C. Karl, Director  
Superfund Division  
U.S. EPA Region 5

2-23-05  
[Date]

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## **Executive Summary**

The City of Windom operated a municipal landfill from the 1930s to 1974. Analysis of the groundwater revealed volatile organic compounds downgradient of the landfill. The site was listed on the National Priorities List in 1986.

The City conducted a Remedial Investigation to determine the extent and magnitude of contamination in 1987, and followed that with a Feasibility Study in 1988. The City submitted the Response Action Plan (RAP) in January 1989, which was revised in March 1989 and subsequently, approved by the MPCA. The RAP included the following response actions:

- Modifications to the City water treatment plant to protect the City water supply
- Site grading and capping to minimize leachate
- Capture and treat groundwater at the landfill

Each of these response actions was implemented. Ongoing inspections, operation and maintenance activities, and groundwater monitoring have been conducted. Annual reports are submitted to the Minnesota Pollution Control Agency (MPCA) that include monitoring data and documentation of inspections, and operation and maintenance activities. In addition, the City constructed a new water treatment plant with increased aeration, which further protects the City water supply.

Each of the response actions has fulfilled its objective. The response actions at the landfill have successfully reduced groundwater concentrations below action levels. During the past year, there have been four quantified detections at the landfill (RWA, cis,1-2 dichloroethene at an average of 1.3 ug/l) of any of the volatile organic compounds analyzed and no quantified detections of vinyl chloride.

The site was deleted from both the Federal National Priorities List and the Minnesota Permanent List of Priorities in 2000.

The remedy remains protective of human health and the environment. The next Five-Year Review is scheduled for 2009.

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## Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ( <i>from WasteLAN</i> ): Windom Municipal Dump		
EPA ID ( <i>from WasteLAN</i> ): MND980034516		
Region: 05	State: MN	City/County: Windom/Cottonwood
SITE STATUS		
NPL status: Final <input checked="" type="checkbox"/> Deleted Other (specify)		
Remediation status (choose all that apply): Under Construction <input checked="" type="checkbox"/> Operating Complete		
Multiple OUs?* YES <input checked="" type="checkbox"/> NO	Construction completion date: 05 / 01 / 1990	
Has site been put into reuse? YES <input checked="" type="checkbox"/> NO		
REVIEW STATUS		
Lead agency: EPA <input checked="" type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency		
Author name: Kurt Schroeder		
Author title: Project Manager	Author affiliation: MPCA	
Review period:** November 2004 to January 2005		
Date(s) of site inspection: 11/22/04		
Type of review: <input type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input checked="" type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion		
Review number: <input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)		
Triggering action: <input type="checkbox"/> Actual RA Onsite Construction at OU # _____ <input type="checkbox"/> Actual RA Start at OU# _____ <input type="checkbox"/> Construction Completion <span style="float: right;"><input checked="" type="checkbox"/> Previous Five-Year Review Report</span> <input type="checkbox"/> Other (specify)		
Triggering action date ( <i>from WasteLAN</i> ): 12/2/99		
Due date ( <i>five years after triggering action date</i> ): 12/2/04		

\* ["OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

## **Five-Year Review Summary Form**

**Issues:** None

**Recommendations and Follow-up Actions:**

The Windom Municipal Dump site should continue to be maintained by the Potentially Responsible Parties (PRPs) in accordance with the Record of Decision and this Five-Year Report.

**Protectiveness Statement:**

All immediate threats at the site have been addressed, and the remedy for the site is protective of human health and the environment.

**Long-term protectiveness**

Long-term protectiveness of the remedial action has been verified by the annual monitoring of groundwater and monthly inspections of the site. An institutional control plan will be developed during 2005.

**Other Comments:** None

## I. Introduction

The MPCA has completed a Five-Year Review of the Remedial Action (RA) conducted at the Windom Municipal Dump, Windom, Minnesota.

This review is intended to evaluate whether the RA remains protective of public health and the environment. The Five-Year Review report identifies any deficiencies found and provides recommendations.

The MPCA is preparing this Five-Year Review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This is the third Five-Year Review for the Site. The second Five-Year Review was completed June 1999. The first Five-Year Review was completed by the MPCA and approved by US Environmental Protection Agency (EPA) Region 5 on February 9, 1995.

# I. Site Chronology

**Table 1: Chronology of Site Events**

Event	Date
Former Windom Dump in Use	1930's-1974
Site Placed on National Superfund List	April 1986
Site Investigation and Alternatives Analysis	1987-1988
Record of Decision (ROD) executed by MPCA	April 7, 1989
Remedial Action Plan	Spring 1989
Remedial Action	Summer 1989
Initiation of ground water extraction from Recovery Well A	May 1, 1990
Long-Term Operation and Monitoring	Summer 1990-Present
Five-Year Review Completed	February 9, 1995
Recovery Wells A and B shut down as per MPCA Approval	September 10, 1999
Five-Year Review completed recommending delisting from Superfund	December 2, 1999
Delisting from Minnesota Permanent List of Priorities	February 2, 2000
Final Close-Out Report signed by EPA	May 10, 2000
Deletion from National Priorities List	October 6, 2000
Recovery Wells A and B restarted as per Contingency Plan	November 16, 2001
Recovery Wells A and B Shutdown as per MPCA Approval	October 7, 2003 (RWA) November 24, 2003 (RWB)

## **II. Background**

### **PHYSICAL CHARACTERISTICS**

The City of Windom, located in Cottonwood County, Minnesota, operated a landfill on the east edge of the city from the 1930s to 1974. The landfill is located south of Thirteenth Street and east of Lakeview Avenue in an abandoned sand and gravel pit covering an area of approximately 11.4 acres. The site location map is shown on Figure 1 and site detail map is shown on Figure 2.

The groundwater at the site is located in glacial outwash deposited from the Des Moines lobe during the Wisconsin glaciation. The glacial outwash is underlain by a thick, low permeability clay layer, which serves as a natural barrier to water flow and protects deeper aquifers from contamination. Depth to the water table is about 50 feet from the ground surface. The saturated thickness of the sand and gravel deposit ranges from 50 to 150 feet. The direction of groundwater flow is generally to the southwest toward the Des Moines River, but can be locally affected by extended pumping from the municipal system.

### **LAND AND RESOURCE USE**

Currently, there are no projected land-uses for the site. There are several private residences and industry within a ½ mile radius of the site, which are supplied potable water by the City of Windom. The city wellfield, which is northwest of the site, currently utilizes eight wells for municipal water supply. The site property is entirely owned by the City of Windom.

### **HISTORY OF CONTAMINATION**

From approximately 1957 to 1974 the site received municipal waste along with industrial waste, paint sludges, solvents, and cleaners. The proximity of the site to the City municipal wellfield (approximately 1,200 feet northwest) prompted the City and the MPCA to evaluate the contamination potential of the site. Six groundwater monitoring wells were installed in November 1982, as part of a preliminary assessment. Analysis of groundwater samples from the

wells detected volatile organic compound (VOC) contamination downgradient of the landfill, most notably 1,1,2,2-tetrachloroethene (PCE), 1,1,2-trichloroethene (TCE), cis-1,2-Dichloroethene (DCE), and Vinyl chloride (VC). The site was listed on the National Priorities List in April 1986.

Various inorganic constituents historically have been detected slightly above background levels in the groundwater. A notable exception is nitrate which was detected at a level of 15 mg/L at MW1. Inorganic constituents were dropped from the monitoring program in 1997. Two consecutive years of inorganic data indicated levels below the action levels, including MW1 where the nitrate concentration dropped to 0.1 mg/l.

As a result of active groundwater pumping and treatment and natural attenuation, groundwater concentrations of VOCs have declined to below action limits. DCE and VC were the only two compounds detected consistently at the landfill since 1996. However, there have been no quantified detections of VC since November 2001. Concentrations of DCE have only been noticed at two wells (RWA and MW9B) at or just above the 1.0 ug/l detection limits since 1998.

The City wellfield is located northwest of the site. City Well 7 is the closest well to the site and is approximately 500 feet northwest. City Well 7 was impacted with VOC concentrations, most notably VC as high as 26 ug/l in April 1990. As a result, City Well 7 was removed from the municipal supply system. City Well 7 was used as a groundwater recovery well and connected to the spray treatment system at the landfill. City Well 7 operated as a recovery well until August of 1994. Monitoring of City Well 7 shows that there have been no detections of VC or DCE since July 1993.

## **INITIAL RESPONSE**

The City and the Toro Company were issued a Request for Response Action (RFRA) by the MPCA on June 24, 1986. The RFRA required the City to conduct a remedial investigation (RI) and a feasibility study (FS), and to prepare and implement a remedial action plan (RAP). The RI was initiated by the City during May 1987, and the final RI report was submitted to the MPCA in October 1987. The FS was submitted by the City to MPCA in September 1988. A Remedial



Action Plan (RAP) was submitted by the City on February 6, 1989. A Record of Decision (ROD) was executed by the Commissioner of the MPCA on April 6, 1989, and the U.S. EPA Region V. Regional Administrator formally concurred with the selected remedy on September 29, 1989. The RA has been performed by the City at the site in accordance with the RFRA and ROD.

## **BASIS FOR TAKING ACTION**

In December 1980, the MPCA initiated an investigation alleging that hazardous wastes may have been disposed of at the site. The MPCA also expressed concern that these hazardous wastes and other wastes disposed of at the site may be a source of pollutants to the nearby municipal water source. Upon further investigation, hazardous substances (as noted in the ROD) that **have been** detected in the groundwater at this site include:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Cis 1,2-Dichloroethene (cis 1,2 DCE or DCE)
- Vinyl Chloride (VC)
- Benzene
- Arsenic
- Nitrates

On several sampling events VC levels in the untreated water has equaled or exceeded the Maximum Contaminant Level (MCL). Concentrations of VC have been below detection limits in all city wells since October 1994, and all monitoring wells since October 2002.

### **III. Remedial Actions**

#### **REMEDY SELECTION**

The U.S. EPA Region V Administrator concurred with the MPCA ROD and the selected remedy for the site on September 29, 1989. The major components of the selected remedial action include (i) protection of municipal water supply through modifications to the existing water plant; (ii) minimization of leachate generated through grading and capping of the site; and (iii) monitoring of groundwater quality with a contingency plan to be implemented if significant groundwater impacts are detected at the site perimeter.

#### **REMEDY IMPLEMENTATION/SYSTEM OPERATIONS AND MAINTENANCE**

##### **Protection of City Wellfield**

To protect the water supply, the filter units at the municipal water treatment plant were modified in September 1988. The purpose of the modifications was to enhance aeration of raw water and hence, remove low levels of VOCs. Modifications of the filter unit involved installation of: (1) a series of pressure spray nozzles on the header distribution pipe to the filter; and (2) power roof ventilators with mist eliminators in the filter venting system. These modifications break the raw water into fine droplets when sprayed onto the gravity filter and increase airflow through the existing vents.

The City of Windom constructed a new water treatment plant in 1997. The first step in the new water treatment plant process is aeration. The primary purpose of the aerator is to enhance oxidation of iron and manganese but also has the dual purpose of volatilizing any VOCs. The aerator is comprised of numerous slotted trays through which a forced draft fan blows to aerate the water much like a stripping tower. After the aerator, the water flows to an open detention tank and filter basins that provide additional opportunities for volatilization.

The municipal water supply wells and distribution system are monitored annually and have not shown detectable levels of VOCs since October 1994.

### **Site Capping**

Construction of the landfill cap began on June 1, 1989, and was completed on August 1, 1989. The landfill surface was graded to obtain a minimum slope of 2 percent and a maximum slope of 25 percent. After grading, the landfill was covered with two feet of low-permeability material, laid down in six-inch lifts. A six-inch granular buffer was placed on the low-permeability material layer which, in turn, was covered by a layer of topsoil. Vegetation was established on the final cover. A gas venting system was also installed upon completion of the cap.

In December 2001, a riprap spillway was installed near MW-5 to control surface water runoff and groundwater infiltration in this area. Construction of a diversion berm and access road regrading was completed in September and October 2002. The berm was constructed to divert surface water back through the saddle and down the south slopes of the landfill as originally designed. In June 2003, the landfill cover was repaired to further minimize leachate formation. The repairs consisted of road grading and modifications to the rip rap channel on the west side of the site and creation of a swale to improve drainage from the site and protect the site from erosion. The cap has been regularly inspected and maintenance performed as required. Routine maintenance has included mowing the vegetation, repairing minor erosion as necessary, and rodent control. Documentation of the repair activities and inspections were sent to the MPCA in the annual monitoring reports and sampling reports (Attachment 1).

### **Groundwater Containment and Treatment**

The ROD called for initial periodic monitoring of groundwater with subsequent implementation of a contingency plan for contaminant migration control if established water quality limits were exceeded. The contingency action specified in the RAP, and adopted in the ROD was a groundwater pump-out treatment system to control and treat the VOCs in the groundwater.

When monitoring of City Well 7 and monitoring well MW-9C detected concentrations of VC above the action level, initiation of groundwater remedial activities were triggered in accordance with the RAP.

A groundwater recovery well (RWA) was installed along the western property boundary in September 1989. An aquifer test coupled with a pilot treatment test were conducted in October 1989. Following completion of the tests, a report entitled "Technical Report – Aquifer and Pilot Treatment Tests" was submitted to the MPCA in November 1989. The report concluded that spray treatment of groundwater at the site was effective in removing VOCs from recovered groundwater and the spray treatment process did not pose a significant health threat. Approval was granted by the MPCA on April 4, 1990, to implement a groundwater pump-out and spray treatment program at the site on an interim basis, pending further evaluation and preparation of a final design of the full-scale pump-out system. On May 1, 1990, the interim system was implemented.

The interim pump-out system consisted of two wells: recovery well RWA located along the western property boundary and City Well 7. The extracted water was spray treated on-site on the south side of the landfill property (Figure 3). The water was sprayed through a spray irrigation gun which distributed it over the land surface for infiltration. The water was sprayed in a quarter-circle shape with an approximate horizontal radius of 130-150 feet over an area of about 15,000 square feet.

Based on the approved final design, Recovery Wells B and C (RWB and RWC) were completed on October 24, 1990. On October 31, 1990, the final recovery system began operation. This system, consisted of Wells RWA and RWC, and City Well 7 discharging through two spray guns to the main spray treatment area, and RWB pumping to spray area B. This system operated continuously in this configuration, except for brief period of downtime for operations and maintenance, until August 1, 1994 when City Well 7 was removed from the recovery system. City Well 7 was removed from the recovery system because it had not had a detection of VC since April 1993.

The system operated with the RWA, RWB and RWC configuration from August 1994 until April 9, 1998. RWC was removed from the groundwater recovery system for the following reasons: it was always a clean well (except for a few one time unconfirmed VOC detections); landfill capture was able to be maintained without it; and it would change the groundwater flow stagnation points between recovery wells, thus enhancing cleanup. More recently, both RWA and RWB were shut down in October and November 2003 respectively. Both recovery systems were shut down as a result of below detectable levels in nearby wells of VC and DCE since July 2002 in RWA and January 1998 in RWB. City Well 7 was also brought on-line once again as part of the municipal water supply. RWA is currently sampled quarterly and RWB is sampled annually. A contingency plan remains in place if levels in any wells exceed the action levels for the site.

#### **APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) REVIEW**

The following ARARS are those specified by the ROD with groundwater recovery and treatment operation.

- 1) Minn. Rules pt. 7035.2815 specifies cap design to minimize the production of leachate from the source area. Compliance with this area is indicated by the improvement of water quality beneath and downgradient of the source area.
- 2) Safe Drinking Water Act (SDWA) (40 CFR Parts 141 – 146). Establishes federal Maximum Contaminant Levels (MCLs) for contaminants in public drinking water supplies. The MCL for vinyl chloride is 2.0 ug/l. Since concentrations are below detection limits for vinyl chloride in all wells and the distribution system, the municipal water supply is in compliance with the MCL.
- 3) Minn. Rules pt. 7050.0220. Requires that discharges to groundwater that will be used for consumption attain MCLs and Minnesota Department of Health Recommended Allowable Limits (RALs) for drinking water. The RALs have been replaced with the Health Risk Limits (HRLs). Concentrations are below detection limits for vinyl chloride

in all monitoring wells and city wells. Therefore, the site is in compliance with the ARAR.

- 4) Clean Water Act (40 CFR 403). There is no water discharged to surface waters, therefore, the site is in compliance with ARAR.
- 5) Minn. Rules pt. 7035.2815. subp. 4.F. Specified requirements for landfill closure and establishes intervention limits to protect off-site contaminant migration that would impact groundwater. The landfill was closed in compliance with these rules. Subsequent to closure, intervention limits for vinyl chloride were exceeded in groundwater, which resulted in the implementation of a groundwater recovery system to control the migration of contaminants. The intervention limit now for vinyl chloride has essentially been met as there are no quantifiable detections of vinyl chloride since April 1998.
- 6) Minn. Stat. §§ 115 and 116 and Minn. Rules ch. 7001 and Minn. Rules pt. 7050.021. Regulates surface water discharge. There is no water discharged to surface waters. Thus the site is in compliance with the ARAR.
- 7) Minn. Stat. § 116.07. subd. 4.A. Regulates air emissions of toxic pollutants. The aeration from the spray treatment area does not require an air quality permit. Therefore, the site is in compliance with the ARAR.

The remedy has complied with the following state requirements. These are:

1. Minn. Rules ch 7060. Establishes uses and the nondegradation goal for groundwater. The installation of the cap has improved the water quality at the Site by reducing the amount of leachate reaching the groundwater and the groundwater concentrations have reached nondetectable or nonquantifiable levels in the monitoring and recovery wells.
2. Minn. Rules ch. 4725 (Water Well Code). Wells installed at the Site have been constructed in accordance with Minnesota Rules Chapter 4725.

3. Minn. Rules ch. 4720.5100 to 4720.5590 (Wellhead Protection Requirements). Requires the City of Windom to prepare a wellhead protection plan (WHP) for the city wellfield. The WHP Plan was submitted in February 2003. The plan was approved by the Minnesota Department of Health (MDH) on November 1, 2004.

## **IV. Progress Since the Last Review**

The last Five-Year Review, completed in 1999, contained several milestone events and recommendations that are summarized as follows:

### **Deletion from the Federal NPL**

The EPA prepared a Final Close-Out Report for the Windom Municipal Dump site on May 10, 2000 followed by a Final Deletion Notice in order to remove the site from the NPL. The Final Deletion Notice appeared in the Federal Register on October 6, 2000.

### **Delisting from Minnesota PLP**

The MPCA delisted the Windom Municipal Dump site from the Minnesota Permanent List of Priorities on February 2, 2000.

### **Termination of Groundwater Treatment**

Termination of the groundwater treatment system initially occurred September 1999 after consistent below detectable levels of DCE and VC. The groundwater treatment system was restarted when a sampling event in November 2001 found detections of DCE and VC in the downgradient wells. In November 2003, the system was again shut down due to below detectable levels of DCE and VC. The system remains off. If groundwater monitoring at any well indicates increases in VOC concentrations, most notably VC, a contingency plan is in place and followed as described in detail in both "Remedial Action Plan" (Wenck Associates, Inc. March 1989) and the "Former Windom Landfill Five-Year Review and 1998-1999 Annual Evaluation Report" (Wenck Associates, Inc. 1999).

### **Clay Cap Maintenance**

The landfill cap has effectively reduced infiltration to the underlying garbage and thereby reduced the risk of further groundwater impacts. In December 2001, a riprap spillway was installed near MW-5 to control surface water runoff and groundwater infiltration in this area. Construction of a diversion berm and access road regrading was completed in September and October 2002. In June 2003 cover repair was completed. The cover repair included road



regrading, modifications to the riprap channel on the west side of the site, and swale creation to promote better drainage off the cap. Monthly inspections are taking place including site security and periodic maintenance of turf and erosion control. Corrective action measures are taken as needed. Annual inspections are also performed by the PRP's contractor. All activities and annual inspections have been documented and submitted to the MPCA in annual monitoring reports and sampling reports from 1999 – 2004.

### **Monitoring**

Monitoring of the landfill monitoring wells and city wells will continue on an annual basis with quarterly monitoring being performed on RWA and CW7 to maintain protection of the city water supply. Monitoring is performed per the plan submitted with the monitoring reports to MPCA.

### **Reporting**

The data from the annual comprehensive monitoring event in April is being submitted to the MPCA within 45 days of sample collection. Data from the quarterly monitoring events is being submitted along with the annual events data. If warranted, MPCA is notified by telephone conversation and data submittal of any exceedances during quarterly monitoring events.

### **Completion of a Wellhead Protection Plan (WHP)**

A Wellhead Protection Plan was submitted to the Minnesota Department of Health (MDH) on behalf of the City of Windom for their municipal drinking water supply in February 2003. The plan was approved on November 1, 2004. The City of Windom Wellhead Protection Plan is included in Attachment 4.

## **V. Five-Year Review Process**

### **COMMUNITY INVOLVEMENT**

This Five-Year Review consisted of the following activities: (1) a review of relevant documents (Attachment 1); (2) discussions among representatives of the MPCA and the PRPs; and, (3) a site inspection on November 22, 2004 by the MPCA and representatives of the PRPs. A legal notice announcing the Five-Year Review was published in the Cottonwood County Citizen in January 2005.

### **DOCUMENT REVIEW**

This Five-Year Review consisted of a review of relevant documents including the ROD, annual/quarterly monitoring reports, MPCA Staff response letters and previous Five-Year Review reports. A list of the documents reviewed are presented in Attachment 1.

### **DATA REVIEW SUBMITTALS**

#### **Water Supply Distribution**

Analysis of the analytical data from municipal drinking water distribution since modifications of the municipal water treatment plant in 1988 continue to be effective in removing low levels of VOCs. Since installed, there have been no detection of any VOCs in the distribution system.

#### **Municipal Wellfield**

Analytical data from samples taken from the municipal wells (excluding CW7) have shown not detections of VOCs since July 1985. CW7 has had no detections of VOCs since July 1993. Both the groundwater recovery system and the cap repairs have been effective in protecting the municipal water supply.

#### **Groundwater Recovery System and Monitoring Wells**

Groundwater extraction has occurred since the initial startup in September 1991 from RWA, RWB, and CW7. Since 1991, over one billion gallons of water have been pumped through the

system. Since the second Five-Year Review (December 1999), over 204 million gallons were pumped through the system. Termination of the ground water treatment system initially occurred September 1999 after finding concentrations of DCE and VC to be consistently below detection limits. The groundwater treatment system was restarted when a sampling event in November 2001 found detections of DCE and VC in the downgradient wells. In November 2003, the system was again shut down due to below detectable levels of DCE and VC. The system remains off.

Since 1999, concentrations of only two VOCs, DCE and VC, have been detected at the site at RWA and MW9B based on information from annual reports and data submittals. Groundwater quality since April 2002 has remained consistently below quantifiable detections for VC. This appears to be attributed to the landfill cap modifications in 2001. Since 1999, detections of DCE have been above the detection limit of 1.0 ug/l a total of fourteen times, however concentrations have all been less than 2.0 ug/l. A table summarizing all VOC data is presented in Table 1.

The horizontal groundwater gradient is generally to the southwest toward the Des Moines River, but can be locally affected by extended pumping from the municipal system.

The annual groundwater monitoring and surface water monitoring have been conducted by the PRP in accordance with the ROD. The sampling has been conducted by the PRP contractor, Wenck Associates, Inc. for sixteen years.

## **SITE INSPECTION**

Annual site inspections by the PRP's contractor is reported in the Annual Monitoring Report.

MPCA conducted a site inspection on November 22, 2004. The purpose of the inspection was to assess the protectiveness of the remedy for preparation of this review. No significant issues have been identified. This inspection report can be found in Attachment 2. Photographs from the above inspections are included in Attachment 3.

## **VI. Technical Assessment**

### **QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?**

The remedy for the site has been shown to be effective. Contaminant levels continue to be below both contingency action levels and the action levels set forth by MPCA. The landfill cap continues to minimize leachate migration into the groundwater. The groundwater recovery system is activated when necessary in accordance with the contingency plan set forth in the approved RAP (March 1989). This system has been effective in protecting the municipal wellfield and reducing VOC concentrations to below action levels.

### **QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (RAOS) USED AT THE TIME OF REMEDY SELECTION STILL VALID?**

**Changes in Standards To Be Considered** – No new standards have been introduced which would be more stringent or which would affect protectiveness of the site.

**Changes in Exposure Pathways** – No changes in the site conditions that affect exposure pathways are evident as part of this Five-Year Review.

**Changes in Toxicity and Other Contaminant Characteristics** – Toxicity and other factors for contaminants of concern have not changed.

**Changes in Risk Assessment Methodologies** – There are no changes in risk assessment methodologies since the time of the ROD approval.

**Remedial Action Objectives** used at the time of the remedy selection are still valid.

### **QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?**

No information has been identified that would call into question the protectiveness of the remedy.

## **VII. Technical Assessment Summary**

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. According to the documents reviewed, the data collected, and the site inspection, the remedy selected by the ROD continues to be appropriate and protective. No contamination has moved offsite. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

## **VIII. Issues**

No issues or deficiencies were observed during this Five-Year Review.

The remedy has been effective in lowering contaminant levels in groundwater to below both contingency action levels and the action levels. However land use restrictions are necessary to ensure that there is no interference with the remedy. A site closure report was filed with the Office of County Recorder in Cottonwood County on October 17th, 1989, No. 199026. The Site Closure Report discusses the closure of the landfill but it does not mention that land use restrictions are necessary to prevent interference with the cap and groundwater extraction wells and that a contingency plan must be implemented if contaminant levels in groundwater exceed contingency action levels. Institutional controls are necessary to ensure that the remedy remains protective of human health and the environment.

## IX. Recommendations and Follow-up Actions

An institutional control plan will be developed within six months of the Report. The institutional control plan should include zoning, a restrictive covenant or other appropriate mechanism that implements the following restrictions on use. The following land use restrictions should run with the Property unless and except in a plan approved in writing by MPCA and the City of Windom.

**No Interference with Remedy** : No action shall be taken to excavate or drill or intrude into, or penetrate or otherwise disturb the three foot cover on the property. No action shall be taken that would cause covered waste materials to become exposed. No action shall be taken that would interfere with or disturb the groundwater extraction wells.

**Land uses:** The Property shall not be used for any of the following purposes:

- (a) Residential, including any dwelling units and rooming units, mobile homes or factory built housing, camping facilities, hotels, or other unit constructed or installed for occupancy on a 24-hour basis;
- (b) A hospital for humans;
- (c) Educational institutions such as a public or private school;
- (d) A day care center for children;
- (e) Any purpose involving occupancy on a 24-hour basis, or
- (f) Any use that would disturb or penetrate the three-foot land cover or groundwater extraction wells.

Ground water uses: No activities shall be conducted on the Property that extract, consume, or otherwise use any groundwater from the Property, nor shall any wells be constructed on the Property for purposes other than as approved in writing by MPCA and the City of Windom. The contingency plan identified in the Response Action Plan will be implemented if contaminants in groundwater exceed contingency levels.

## **X. Protectiveness Statement**

The results of the Five-Year Review indicate that the remedy is protective of human health and the environment. The remedy of minimizing the leachate from the landfill, monitoring of groundwater, and controlling groundwater contaminant migration, have been shown to be effective. The site has not been shown to cause any significant adverse impact on the environment. An institutional control plan to ensure that there is no interference with the remedy will be developed within six months of the Five Year Review Report.



## **XI. Next Review**

This is a statutory Five-Year Review. Previous five-year reviews were conducted in 1995 and 1999. The next Five-Year Review for this site will be conducted in the year 2009.

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## Table

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TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzd By	cis-1,2-Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
<u>SUPPLY SYSTEM:</u>					
CITY WELL 3	07-Jun-82	MDH	MDH	--	--
CITY WELL 3	11-Mar-86	MDH	MDH	<0.2	NQ
CITY WELL 3	10-Jun-87	MDH	MDH	<0.2	NQ
CITY WELL 3	24-Jul-87	EAH	UHL	<1.0	<1.0
CITY WELL 3	25-Oct-88	WAI	UHL	<1.0	<1.0
CITY WELL 3	06-Jul-89	WAI	UHL	<1.0	<1.0
CITY WELL 3	24-Jul-90	WAI	UHL	<1.0	<1.0
CITY WELL 3	23-Jul-91	WAI	UHL	<1.0	<1.0
CITY WELL 3	20-Jul-92	WAI	UHL	<1.0	<1.0
CITY WELL 3	07-Jul-93	WAI	UHL	<1.0	<1.0
CITY WELL 3	11-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 3	16-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 3	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 3	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 3	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 3	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 3	17-Apr-01	WAI	UHL	<1.0	<1.0
CITY WELL 3	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 3	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 3 (Dup)	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 3	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 4	26-Mar-81	MDH	MDH	--	--
CITY WELL 4	07-Jun-82	MDH	MDH	--	--
CITY WELL 4	22-Jul-85	MDH	MDH	<0.20	--
CITY WELL 4	11-Mar-86	MDH	MDH	<0.2	NQ
CITY WELL 4	10-Jun-87	MDH	MDH	<0.2	NQ
CITY WELL 4	24-Jul-87	EAH	UHL	<1.0	<1.0
CITY WELL 4	25-Oct-88	WAI	UHL	<1.0	<1.0
CITY WELL 4	06-Jul-89	WAI	UHL	<1.0	<1.0
CITY WELL 4	24-Jul-90	WAI	UHL	<1.0	<1.0
CITY WELL 4	23-Jul-91	WAI	UHL	<1.0	<1.0
CITY WELL 4	21-Jul-92	WAI	UHL	<1.0	<1.0
CITY WELL 4	07-Jul-93	WAI	UHL	<1.0	<1.0
CITY WELL 4	11-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 4	16-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 4	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 4	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 4	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 4	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 4	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 4	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 4	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 4	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 5	26-Mar-81	MDH	MDH	--	--
CITY WELL 5	07-Jun-82	MDH	MDH	--	--
CITY WELL 5	22-Jul-85	MDH	MDH	<0.20	--
CITY WELL 5	11-Mar-86	MDH	MDH	<0.2	NQ
CITY WELL 5	10-Jun-87	MDH	MDH	<0.2	NQ
CITY WELL 5	24-Jul-87	EAH	UHL	<1.0	<1.0
CITY WELL 5	25-Oct-88	WAI	UHL	<1.0	<1.0
CITY WELL 5	06-Jul-89	WAI	UHL	<1.0	<1.0
CITY WELL 5	24-Jul-90	WAI	UHL	<1.0	<1.0
CITY WELL 5	23-Jul-91	WAI	UHL	<1.0	<1.0
CITY WELL 5	21-Jul-92	WAI	UHL	<1.0	<1.0
CITY WELL 5	07-Jul-93	WAI	UHL	<1.0	<1.0
CITY WELL 5	11-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 5	16-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 5	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 5	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 5	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 5	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 5	17-Apr-01	WAI	UHL	<1.0	<1.0
CITY WELL 5	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 5 (Dup)	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 5	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 5	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 6	13-Mar-81	CITY	SERCO	--	--
CITY WELL 6	26-Mar-81	MDH	MDH	--	--
CITY WELL 6	07-Jun-82	MDH	MDH	--	--
CITY WELL 6	22-Jul-85	MDH	MDH	<0.20	--
CITY WELL 6	11-Mar-86	MDH	MDH	<0.2	NQ
CITY WELL 6	10-Jun-87	MDH	MDH	<0.2	NQ
CITY WELL 6	24-Jul-87	EAH	UHL	<1.0	<1.0
CITY WELL 6	25-Oct-88	MPCA	MDH	<0.2	<0.5
CITY WELL 6	25-Oct-88	WAI	UHL	<1.0	<1.0
CITY WELL 6	06-Jul-89	WAI	UHL	<1.0	<1.0
CITY WELL 6	27-Sep-89	WAI	UHL	<1.0	<1.0
CITY WELL 6	25-Jan-90	CITY	UHL	<1.0	<1.0
CITY WELL 6	18-Apr-90	MPCA	MDH	<0.2	<1.0
CITY WELL 6	18-Apr-90	WAI	UHL	<1.0	<1.0
CITY WELL 6	24-Jul-90	WAI	UHL	<1.0	<1.0
CITY WELL 6	24-Jul-90	MPCA	MDH	<0.2	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon By	Anlyzd By	cis-1,2- Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
CITY WELL 6	24-Oct-90	WAI	UHL	<1.0	<1.0
CITY WELL 6	17-Jan-91	MPCA	MDH	<0.2	<1.0
CITY WELL 6	17-Jan-91	WAI	UHL	<1.0	<1.0
CITY WELL 6	24-Apr-91	WAI	UHL	<1.0	<1.0
CITY WELL 6	23-Jul-91	WAI	UHL	<1.0	<1.0
CITY WELL 6	22-Oct-91	WAI	UHL	<1.0	<1.0
CITY WELL 6	28-Jan-92	CITY	UHL	<1.0	<1.0
CITY WELL 6	13-Apr-92	CITY	UHL	<1.0	<1.0
CITY WELL 6	20-Jul-92	WAI	UHL	<1.0	<1.0
CITY WELL 6	27-Oct-92	WAI	UHL	<1.0	<1.0
CITY WELL 6	19-Jan-93	CITY	UHL	<1.0	<1.0
CITY WELL 6	06-Apr-93	WAI	UHL	<1.0	<1.0
CITY WELL 6	07-Jul-93	WAI	UHL	<1.0	<1.0
CITY WELL 6	26-Oct-93	WAI	UHL	<1.0	<1.0
CITY WELL 6	24-Jan-94	CITY	UHL	<1.0	<1.0
CITY WELL 6	06-Apr-94	WAI	UHL	<1.0	<1.0
CITY WELL 6	11-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 6	03-Oct-94	WAI	UHL	<1.0	<1.0
CITY WELL 6	19-Jan-95	CITY	UHL	<1.0	<1.0
CITY WELL 6	05-Apr-95	WAI	UHL	<1.0	<1.0
CITY WELL 6	18-Jul-95	CITY	UHL	<1.0	<1.0
CITY WELL 6	17-Oct-95	WAI	UHL	<1.0	<1.0
CITY WELL 6	24-Jan-96	CITY	UHL	<1.0	<1.0
CITY WELL 6	18-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 6	23-Jul-96	CITY	UHL	<1.0	<1.0
CITY WELL 6	15-Oct-96	WAI	UHL	<1.0	<1.0
CITY WELL 6	22-Jan-97	CITY	UHL	<1.0	<1.0
CITY WELL 6	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 6	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 6	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 6	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 6	17-Apr-01	WAI	UHL	<1.0	<1.0
CITY WELL 6	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 6	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 6	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 7	13-Mar-81	CITY	SERCO	--	--
CITY WELL 7	26-Mar-81	MDH	MDH	--	--
CITY WELL 7	07-Jun-82	MDH	MDH	--	--
CITY WELL 7	22-Jul-85	MDH	MDH	0.22	--
CITY WELL 7	05-Sep-85	MDH	MDH	<0.20	--
CITY WELL 7	24-Feb-86	EAH	UHL	<0.2	<1
CITY WELL 7	11-Mar-86	MDH	MDH	<0.2	NQ
CITY WELL 7	19-Aug-86	EAH	UHL	0.3	<10
CITY WELL 7	25-Nov-86	EAH	UHL	<0.2	<10
CITY WELL 7	10-Jun-87	MDH	MDH	0.2	PP(5)
CITY WELL 7	23-Jun-87	EAH	ALR	<0.3	PP(5)
CITY WELL 7	23-Jun-87	EAH	UHL	1.4	3.4
CITY WELL 7	24-Jul-87	EAH	ALR	<1	<1
CITY WELL 7	24-Jul-87	EAH	UHL	1	2
CITY WELL 7	28-Oct-87	EAH	UHL	<1	<1
CITY WELL 7	28-Oct-87	EAH	ALR	<1	<2
CITY WELL 7	14-Mar-88	EAH	ALR	<1	<0.5
CITY WELL 7	14-Mar-88	EAH	UHL	1	4
CITY WELL 7	12-May-88	WAI	UHL	1	<1
CITY WELL 7	12-May-88	WAI	ALR	2	<1
CITY WELL 7	12-May-88	MPCA	MDH	1.8	1.9
CITY WELL 7	19-Jul-88	WAI	UHL	2	<1
CITY WELL 7	19-Jul-88	MPCA	MDH	2.1	PP(5)
CITY WELL 7	21-Sep-88	WAI	UHL	1	5
CITY WELL 7	25-Oct-88	MPCA	MDH	1.8	4.2
CITY WELL 7	25-Oct-88	WAI	UHL	1	5
CITY WELL 7	27-Nov-88	WAI	UHL	1	1
CITY WELL 7	21-Feb-89	CITY	UHL	2	3
CITY WELL 7	03-Apr-89	MPCA	MDH	1.9	2.1
CITY WELL 7	03-Apr-89	WAI	UHL	2	3
CITY WELL 7	02-May-89	CITY	UHL	3	4
CITY WELL 7	05-Jun-89	WAI	UHL	3	10
CITY WELL 7	05-Jul-89	WAI	UHL	5	21
CITY WELL 7	27-Sep-89	WAI	UHL	1	6
CITY WELL 7	25-Jan-90	CITY	UHL	4	15
CITY WELL 7	18-Apr-90	WAI	UHL	7	26
CITY WELL 7	18-Apr-90	MPCA	MDH	6.8	22
CITY WELL 7	13-Jun-90	WAI	UHL	6	14
CITY WELL 7	24-Jul-90	MPCA	MDH	4.7	3
CITY WELL 7	24-Jul-90	WAI	UHL	4	6
CITY WELL 7	24-Oct-90	WAI	UHL	2	3
CITY WELL 7	14-Nov-90	WAI	UHL	3	3
CITY WELL 7	18-Dec-90	WAI	UHL	2	3
CITY WELL 7	17-Jan-91	MPCA	MDH	2.3	1
CITY WELL 7	17-Jan-91	WAI	UHL	2	2
CITY WELL 7	24-Apr-91	WAI	UHL	2	1
CITY WELL 7	23-Jul-91	WAI	UHL	2	1
CITY WELL 7	21-Oct-91	WAI	UHL	2	1
CITY WELL 7	28-Jan-92	CITY	UHL	1	PP
CITY WELL 7	06-Apr-92	WAI	UHL	1	1

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations: ug/L)**

Well	Date	Mon. By	Anlyz By	cis-1,2-Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
CITY WELL 7	21-Jul-92	WAI	UHL	1	PP
CITY WELL 7	27-Oct-92	WAI	UHL	1	PP
CITY WELL 7	19-Jan-93	CITY	UHL	1	PP (0.2)
CITY WELL 7	05-Apr-93	WAI	UHL	<1.0	PP (0.2)
CITY WELL 7	07-Jul-93	WAI	UHL	<1.0	<1.0
CITY WELL 7	26-Oct-93	WAI	UHL	<1.0	<1.0
CITY WELL 7	24-Jan-94	CITY	UHL	<1.0	<1.0
CITY WELL 7	06-Apr-94	WAI	UHL	<1.0	<1.0
CITY WELL 7 (Dup)	06-Apr-94	WAI	UHL	<1.0	<1.0
CITY WELL 7	12-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 7 (Dup)	12-Jul-94	WAI	UHL	<1.0	<1.0
CITY WELL 7	03-Oct-94	WAI	UHL	<1.0	<1.0
CITY WELL 7 (Dup)	03-Oct-94	WAI	UHL	<1.0	<1.0
CITY WELL 7	19-Jan-95	CITY	UHL	<1.0	<1.0
CITY WELL 7 (Dup)	19-Jan-95	CITY	UHL	<1.0	<1.0
CITY WELL 7	05-Apr-95	WAI	UHL	<1.0	<1.0
CITY WELL 7	18-Jul-95	CITY	UHL	<1.0	<1.0
CITY WELL 7	17-Oct-95	WAI	UHL	<1.0	<1.0
CITY WELL 7	24-Jan-96	CITY	UHL	<1.0	<1.0
CITY WELL 7	17-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 7	23-Jul-96	CITY	UHL	<1.0	<1.0
CITY WELL 7	15-Oct-96	WAI	UHL	<1.0	<1.0
CITY WELL 7	15-Oct-96	MPCA	MDH	<0.2	<0.2
CITY WELL 7	22-Jan-97	CITY	UHL	<1.0	<1.0
CITY WELL 7	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 7	28-Oct-97	WAI	UHL	<1.0	<1.0
CITY WELL 7	21-Jan-98	CITY	UHL	<1.0	<1.0
CITY WELL 7	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 7	13-Apr-99	WAI	UHL	<1.0	<1.0
CITY WELL 7	27-Oct-99	WAI	UHL	<1.0	<1.0
CITY WELL 7	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 7 (Dup)	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 7	26-Sep-00	WAI	UHL	<1.0	<1.0
CITY WELL 7	17-Apr-01	WAI	UHL	<1.0	<1.0
CITY WELL 7	06-Nov-01	WAI	UHL	<1.0	<1.0
CITY WELL 7	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 7	16-Jul-02	WAI	EnChem	<1.0	<1.0
CITY WELL 7	30-Oct-02	WAI	EnChem	<1.0	<1.0
CITY WELL 7	04-Dec-02	CITY	EnChem	<1.0	<1.0
CITY WELL 7	21-Jan-03	CITY	EnChem	<1.0	<1.0
CITY WELL 7	29-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 7	10-Jun-03	CITY	EnChem	<1.0	<1.0
CITY WELL 7	09-Jul-03	CITY	EnChem	<1.0	<1.0
CITY WELL 7	07-Aug-03	CITY	EnChem	<1.0	<1.0
CITY WELL 7	09-Sep-03	CITY	EnChem	<1.0	<1.0
CITY WELL 7	12-Jan-04	CITY	EnChem	<1.0	<1.0
CITY WELL 7	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 7	00-Jan-00	CITY	EnChem	<1.0	<1.0
CITY WELL 7	21-Sep-04	CITY	EnChem	<1.0	<1.0
CITY WELL 7	20-Jul-04	CITY	EnChem	<1.0	<1.0
CITY WELL 7	18-Aug-04	CITY	EnChem	<1.0	<1.0
CITY WELL 7	12-Oct-04	CITY	EnChem	<1.0	<1.0
CITY WELL 8	11-Apr-91	CITY	UHL	<1.0	<1.0
CITY WELL 8	21-Oct-91	WAI	UHL	<1.0	<1.0
CITY WELL 8	28-Jan-92	CITY	UHL	<1.0	PP
CITY WELL 8	26-Feb-92	CITY	UHL	--	PP
CITY WELL 8 (Dup)	26-Feb-92	CITY	UHL	--	PP
CITY WELL 8	06-Apr-92	WAI	UHL	<1.0	PP
CITY WELL 8	20-Jul-92	WAI	UHL	<1.0	PP
CITY WELL 8	27-Oct-92	WAI	UHL	<1.0	PP
CITY WELL 8	27-Oct-92	MPCA	MDH	<0.2	<1.0
CITY WELL 8	19-Jan-93	CITY	UHL	<1.0	PP (0.4)
CITY WELL 8 (Dup)	19-Jan-93	CITY	UHL	<1.0	PP (0.4)
CITY WELL 8	05-Apr-93	WAI	UHL	<1.0	PP (0.3)
CITY WELL 8	07-Jul-93	WAI	UHL	<1.0	PP (0.2)
CITY WELL 8	26-Oct-93	WAI	UHL	<1.0	PP (0.1)
CITY WELL 8	26-Oct-93	MPCA	MDH	<0.2	<1.0
CITY WELL 8	24-Jan-94	CITY	UHL	<1.0	PP (0.1)
CITY WELL 8 (Dup)	24-Jan-94	CITY	UHL	<1.0	PP (0.2)
CITY WELL 8	06-Apr-94	WAI	UHL	<1.0	PP (0.3)
CITY WELL 8	12-Jul-94	WAI	UHL	<1.0	PP (0.09)
CITY WELL 8	03-Oct-94	WAI	UHL	<1.0	<1.0
CITY WELL 8	19-Jan-95	CITY	UHL	<1.0	<1.0
CITY WELL 8	05-Apr-95	WAI	UHL	<1.0	<1.0
CITY WELL 8	18-Jul-95	CITY	UHL	<1.0	<1.0
CITY WELL 8	17-Oct-95	WAI	UHL	<1.0	<1.0
CITY WELL 8	24-Jan-96	CITY	UHL	<1.0	<1.0
CITY WELL 8	17-Apr-96	WAI	UHL	<1.0	<1.0
CITY WELL 8	23-Jul-96	CITY	UHL	<1.0	<1.0
CITY WELL 8	15-Oct-96	WAI	UHL	<1.0	<1.0
CITY WELL 8	22-Jan-97	CITY	UHL	<1.0	<1.0
CITY WELL 8	15-Apr-97	WAI	UHL	<1.0	<1.0
CITY WELL 8	06-Apr-98	WAI	UHL	<1.0	<1.0
CITY WELL 8	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 8	04-Apr-00	WAI	UHL	<1.0	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations: ug/L)**

Well	Date	Mon. By	Anlyzrd By	cis-1,2- Dichloro ethene	Vinyl Chloride
<b>ACTION LEVELS</b>				17	ND
CITY WELL 8*	11-Apr-00	CITY	UHL	<1.0	<1.0
CITY WELL 8	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 8	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 8	28-Apr-04	WAI	EnChem	<1.0	<1.0
* Sample was taken at distribution center					
CITY WELL 9	07-Oct-98	WAI	UHL	<1.0	<1.0
CITY WELL 9	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 9	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 9	17-Apr-01	WAI	UHL	<1.0	<1.0
CITY WELL 9	04-Apr-02	WAI	UHL	<1.0	<1.0
CITY WELL 9	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 9	28-Apr-04	WAI	EnChem	<1.0	<1.0
CITY WELL 10	07-Oct-98	WAI	UHL	<1.0	<1.0
CITY WELL 10	31-Mar-99	WAI	UHL	<1.0	<1.0
CITY WELL 10*	04-Apr-00	WAI	UHL	<1.0	<1.0
CITY WELL 10	11-Apr-00	CITY	UHL	<1.0	<1.0
CITY WELL 10*	11-Apr-00	CITY	UHL	<1.0	<1.0
CITY WELL 10	04-Apr-02	CITY	UHL	<1.0	<1.0
CITY WELL 10	30-Apr-03	WAI	EnChem	<1.0	<1.0
CITY WELL 10	28-Apr-04	WAI	EnChem	<1.0	<1.0
* Sample was taken at distribution center					
FILT.UNIT 1 (W/CW7)	28-Oct-87	EAH	UHL	<1	<1
FILT.UNIT 1 (W/CW7)	12-May-88	MPCA	MDH	1.2	--
FILT.UNIT 1 (W/CW7)	12-May-88	WAI	ALR	1	<1
FILT.UNIT 1 (W/CW7)	19-Jul-88	WAI	UHL	1	1
FILT.UNIT 1 (W/CW7)	19-Jul-88	MPCA	MDH	1.4	NQ
FILT.UNIT 1 (W/CW7)	21-Sep-88	WAI	UHL	<1(5)	<1
FILT.UNIT 1 (W/CW7)	25-Oct-88	WAI	UHL	1	<1.0
FILT.UNIT 1 (W/CW4 & 5)	27-Nov-88	WAI	UHL	<1	<1.0
FILT.UNIT 1 (W/CW4 & 5)	27-Nov-88	WAI	UHL	<1	<1.0
FILT.UNIT 1 (W/CW7)	27-Nov-88	WAI	UHL	<1	<1.0
FILT.UNIT 1 (W/CW7)	21-Feb-89	CITY	UHL	1	<1.0
FILT.UNIT 1 (W/CW7)	03-Apr-89	WAI	UHL	1	<1(5)
FILT.UNIT 1 (W/CW7)	02-May-89	CITY	UHL	1	<1(5)
FILT.UNIT 1 (W/CW7)	05-Jun-89	WAI	UHL	1	<1(5)
FILT.UNIT 1 (W/CW7)	07-Jul-89	WAI	UHL	2	<1.0
FILT.UNIT 2 (W/CW7)	21-Sep-88	WAI	UHL	<1(5)	<1
FILT.UNIT 2 (W/CW7)	25-Oct-88	MPCA	MDH	0.7	<0.5
FILT.UNIT 2 (W/CW7)	25-Oct-88	WAI	UHL	<1(5)	<1.0
FILT.UNIT 2 (W/CW7)	27-Nov-88	WAI	UHL	<1	<1.0
FILT.UNIT 2 (W/CW7)	21-Feb-89	CITY	UHL	1	<1.0
FILT.UNIT 2 (W/CW7)	03-Apr-89	MPCA	MDH	0.8	<0.5
FILT.UNIT 2 (W/CW7)	03-Apr-89	WAI	UHL	1	<1
FILT.UNIT 2 (W/CW7)	02-May-89	CITY	UHL	1	<1
FILT.UNIT 2 (W/CW7)	05-Jun-89	WAI	UHL	1	<1
DIST SYS (W/CW7)	03-Apr-89	WAI	UHL	1	<1(5)
DIST SYS (W/CW7)	02-May-89	CITY	UHL	1	<1(5)
DIST SYS (W/CW7)	05-Jun-89	WAI	UHL	1	<1
DIST SYS (W/CW6)	27-Sep-89	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW6)	25-Jan-90	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW6)	18-Apr-90	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW6)	18-Apr-90	MPCA	MDH	<0.2	<1.0
DIST SYS (W/CW6)	24-Jul-90	MPCA	MDH	<0.2	<1.0
DIST SYS (W/CW6)	24-Jul-90	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW6)	23-Jul-91	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW6)	22-Oct-91	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	06-Apr-92	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	20-Jul-92	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	27-Oct-92	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	19-Jan-93	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	05-Apr-93	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	07-Jul-93	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	26-Oct-93	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	24-Jan-94	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	06-Apr-94	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	12-Jul-94	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	03-Oct-94	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	19-Jan-95	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	05-Apr-95	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	18-Jul-95	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	17-Oct-95	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	24-Jan-96	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	17-Apr-96	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW6)	23-Jul-96	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	15-Oct-96	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	22-Jan-97	CITY	UHL	<1.0	<1.0
DIST SYS (W/CW8)	15-Apr-97	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	06-Apr-98	WAI	UHL	<1.0	<1.0
DIST SYS (W/CW8)	31-Mar-99	WAI	UHL	<1.0	<1.0
DIST SYS	04-Apr-02	WAI	UHL	<1.0	<1.0
DIST SYS	30-Apr-03	WAI	EnChem	<1.0	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations: ug/L)**

Well	Date	Mon. By	Anlyzr By	cis-1,2-Dichloroethene	Vinyl Chloride
ACTION LEVELS				17	ND
CITY WELL 10	28-Apr-04	WAI	EnChem	<1.0	<1.0
<u>MONITOR WELLS:</u>					
MW1	14-Dec-82	SERCO	SERCO	--	--
MW1	11-Apr-83	SERCO	SERCO	--	--
MW1	11-Jul-83	SERCO	SERCO	--	--
MW1	18-Oct-83	SERCO	SERCO	--	--
MW1	29-May-85	MPCA	MDH	<0.20	--
MW1	31-Jul-85	MPCA	MDH	<0.20	--
MW1	24-Feb-86	EAH	UHL	<0.2	<1
MW1	24-Feb-86	MPCA	MDH	<0.20	--
MW1	19-Aug-86	EAH	UHL	<0.2	<10
MW1	23-Jun-87	EAH	UHL	1.2	<5
MW1	11-Aug-87	EAH	UHL	1	<1
MW1	20-Jul-88	WAI	UHL	<1	<1
MW1	25-Oct-88	WAI	UHL	1	<1
MW1	03-Apr-89	WAI	UHL	1	<1
MW1	06-Jul-89	WAI	UHL	1	<1.0
MW1	27-Sep-89	WAI	UHL	1	<1.0
MW1	18-Apr-90	WAI	UHL	1	<1.0
MW1	18-Apr-90	MPCA	MDH	0.7	<1.0
MW1	23-Jul-90	WAI	UHL	1	<1.0
MW1	24-Oct-90	WAI	UHL	<1	<1.0
MW1	24-Apr-91	WAI	UHL	4	<1.0
MW1	22-Jul-91	WAI	UHL	4	<1.0
MW1	21-Oct-91	WAI	UHL	3	<1.0
MW1	06-Apr-92	WAI	UHL	1	<1.0
MW1	20-Jul-92	WAI	UHL	1	PP
MW1	27-Oct-92	WAI	UHL	1	<1.0
MW1	05-Apr-93	WAI	UHL	<1.0	<1.0
MW1	08-Jul-93	WAI	UHL	<1.0	<1.0
MW1	26-Oct-93	WAI	UHL	<1.0	<1.0
MW1	06-Apr-94	WAI	UHL	<1.0	<1.0
MW1	11-Jul-94	WAI	UHL	<1.0	<1.0
MW1	03-Oct-94	WAI	UHL	<1.0	<1.0
MW1	05-Apr-95	WAI	UHL	<1.0	PP(0.5)
MW1	17-Oct-95	WAI	UHL	<1.0	3
MW1	16-Apr-96	WAI	UHL	<1.0	2
MW1	15-Oct-96	WAI	UHL	<1.0	4
MW1	15-Apr-97	WAI	UHL	<1.0	2
MW1	28-Oct-97	WAI	UHL	<1.0	2
MW1	06-Apr-98	WAI	UHL	<1.0	2
MW1	07-Oct-98	WAI	UHL	<1.0	PP(0.5)
MW1	31-Mar-99	WAI	UHL	<1.0	PP(0.2)
MW1	27-Oct-99	WAI	UHL	<1.0	PP(0.2)
MW1(Dup)	27-Oct-99	WAI	UHL	<1.0	PP(0.2)
MW1	05-Apr-00	WAI	UHL	<1.0	PP(0.2)
MW1	26-Sep-00	WAI	UHL	<1.0	<1.0
MW1	17-Apr-01	WAI	UHL	<1.0	<1.0
MW1	03-Apr-02	WAI	UHL	<1.0	<1.0
MW1	16-Jul-02	WAI	EnChem	<1.0	<1.0
MW2	14-Dec-82	SERCO	SERCO	--	--
MW2	11-Apr-83	SERCO	SERCO	--	--
MW2	11-Jul-83	SERCO	SERCO	--	--
MW2	18-Oct-83	SERCO	SERCO	--	--
MW2	29-May-85	MPCA	MDH	<0.20	--
MW2	31-Jul-85	MPCA	MDH	<0.20	--
MW2	24-Feb-86	MPCA	MDH	<0.20	--
MW2	19-Aug-86	EAH	UHL	<0.2	<10
MW2	23-Jun-87	EAH	UHL	<0.2	<5
MW2	20-Jul-88	WAI	UHL	<1	<1
MW2	25-Oct-88	WAI	UHL	<1	<1
MW2	03-Apr-89	WAI	UHL	<1	<1
MW2	06-Jul-89	WAI	UHL	<1	<1.0
MW2	27-Sep-89	WAI	UHL	<1.0	<1.0
MW2	17-Apr-90	WAI	UHL	<1.0	<1.0
MW2	23-Jul-90	WAI	UHL	<1.0	<1.0
MW2	24-Oct-90	WAI	UHL	<1.0	<1.0
MW2	24-Apr-91	WAI	UHL	<1.0	<1.0
MW2	22-Jul-91	WAI	UHL	<1.0	<1.0
MW2	21-Oct-91	WAI	UHL	<1.0	<1.0
MW2	06-Apr-92	WAI	UHL	<1.0	<1.0
MW2	20-Jul-92	WAI	UHL	<1.0	<1.0
MW2	27-Oct-92	WAI	UHL	<1.0	<1.0
MW2	05-Apr-93	WAI	UHL	<1.0	<1.0
MW2	08-Jul-93	WAI	UHL	<1.0	<1.0
MW2	26-Oct-93	WAI	UHL	<1.0	<1.0
MW2	06-Apr-94	WAI	UHL	<1.0	<1.0
MW2	11-Jul-94	WAI	UHL	<1.0	<1.0
MW2	03-Oct-94	WAI	UHL	<1.0	<1.0
MW2	05-Apr-95	WAI	UHL	<1.0	<1.0
MW2	16-Apr-96	WAI	UHL	<1.0	<1.0
MW2	15-Apr-97	WAI	UHL	<1.0	<1.0
MW2	05-Apr-00	WAI	UHL	<1.0	<1.0
MW2 (Dup)	05-Apr-00	WAI	UHL	<1.0	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzd By	cis-1,2-Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
MW2	17-Apr-01	WAI	UHL	<1.0	<1.0
MW2	04-Apr-02	WAI	UHL	<1.0	<1.0
MW2	29-Apr-03	WAI	EnChem	<1.0	<1.0
MW2	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW3	14-Dec-82	SERCO	SERCO	--	--
MW3	11-Apr-83	SERCO	SERCO	--	--
MW3	11-Jul-83	SERCO	SERCO	--	--
MW3	18-Oct-83	SERCO	SERCO	--	--
MW3	29-May-85	MPCA	MDH	<0.20	--
MW3	24-Feb-86	MPCA	MDH	<0.20	--
MW3	19-Aug-86	EAH	UHL	<0.2	<10
MW3	24-Jun-87	EAH	UHL	<0.2	<5
MW3	03-Apr-89	WAI	UHL	<1	<1
MW4	14-Dec-82	SERCO	MDH	0.2	--
MW4	14-Dec-82	SERCO	SERCO	--	--
MW4	11-Apr-83	SERCO	SERCO	--	--
MW4	11-Jul-83	SERCO	SERCO	--	--
MW4	18-Oct-83	SERCO	SERCO	--	--
MW4	29-May-85	MPCA	MDH	<0.20	--
MW4	31-Jul-85	MPCA	MDH	<0.20	--
MW4	24-Feb-86	MPCA	MDH	<0.20	--
MW4	19-Aug-86	EAH	UHL	<0.2	<10
MW4	23-Jun-87	EAH	UHL	<0.2	<5
MW4	06-Jul-89	WAI	UHL	<1	<1.0
MW4	27-Sep-89	WAI	UHL	<1.0	<1.0
MW4	17-Apr-90	WAI	UHL	<1.0	<1.0
MW4	23-Jul-90	WAI	UHL	<1.0	<1.0
MW4	22-Jul-91	WAI	UHL	<1.0	<1.0
MW4	21-Jul-92	WAI	UHL	<1.0	<1.0
MW4	08-Jul-93	WAI	UHL	<1.0	<1.0
MW4	11-Jul-94	WAI	UHL	<1.0	<1.0
MW4	16-Apr-96	WAI	UHL	<1.0	<1.0
MW4	16-Apr-96	WAI	UHL	<1.0	<1.0
MW5	14-Dec-82	SERCO	SERCO	--	--
MW5	11-Apr-83	SERCO	SERCO	--	--
MW5	11-Jul-83	SERCO	SERCO	--	--
MW5	18-Oct-83	SERCO	SERCO	--	--
MW5	29-May-85	MPCA	MDH	300	--
MW5	24-Feb-86	EAH	UHL	170	<1
MW5	19-Aug-86	EAH	UHL	215	<10
MW5	24-Jun-87	EAH	UHL	550	63
MW5	24-Jun-87	EAH	ALR	51	<10
MW5 (Dup)	24-Jun-87	EAH	UHL	730	53
MW5	11-Aug-87	EAH	UHL	250	100
MW5	03-Apr-89	WAI	UHL	81	330
MW5	06-Jul-89	WAI	UHL	98	690
MW5	27-Sep-89	WAI	UHL	78	320
MW5	18-Apr-90	WAI	UHL	110	240
MW5	18-Apr-90	MPCA	MDH	51	67
MW5	23-Jul-90	WAI	UHL	88	46
MW5	24-Oct-90	WAI	UHL	9	5
MW5	24-Apr-91	WAI	UHL	<1.0	<1.0
MW5	22-Jul-91	WAI	UHL	<1.0	<1.0
MW5	21-Oct-91	WAI	UHL	<1.0	<1.0
MW5	06-Apr-92	WAI	UHL	<1.0	<1.0
MW5	21-Jul-92	WAI	UHL	<1.0	<1.0
MW5	27-Oct-92	WAI	UHL	<1.0	<1.0
MW5	05-Apr-93	WAI	UHL	<1.0	<1.0
MW5	08-Jul-93	WAI	UHL	1	3
MW5	26-Oct-93	WAI	UHL	<1.0	<1.0
MW5	06-Apr-94	WAI	UHL	<1.0	<1.0
MW5	11-Jul-94	WAI	UHL	<1.0	<1.0
MW5	03-Oct-94	WAI	UHL	<1.0	<1.0
MW5 (Dup)	03-Oct-94	WAI	UHL	<1.0	<1.0
MW5	05-Apr-95	WAI	UHL	<1.0	<1.0
MW5	17-Apr-96	WAI	UHL	<1.0	<1.0
MW5	15-Apr-97	WAI	UHL	<1.0	<1.0
MW5	06-Apr-98	WAI	UHL	<1.0	<1.0
MW5 (Dup)	06-Apr-98	WAI	UHL	<1.0	<1.0
MW5	31-Mar-99	WAI	UHL	<1.0	<1.0
MW5	23-Jul-01	WAI	UHL	<1.0	2
MW5	06-Nov-01	WAI	UHL	<1.0	7
MW5	04-Apr-02	WAI	UHL	<1.0	PP(0.9)
MW5	16-Jul-02	WAI	EnChem	<1.0	<1.0
MW5	30-Oct-02	WAI	EnChem	<1.0	<1.0
MW5 (Dup)	30-Oct-02	WAI	EnChem	<1.0	<1.0
MW5	29-Apr-03	WAI	EnChem	<1.0	<1.0
MW5	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW5A	24-Jun-87	EAH	UHL	130	62
MW5A	11-Aug-87	EAH	ALR	99	110
MW5A	11-Aug-87	EAH	UHL	110	96
MW5A	14-Mar-88	EAH	ALR	180	1

1) Blank contaminated with chloroform 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.



TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations: ug/L)**

Well	Date	Mon. By	Anlyzr By	cis-1,2-Dichloro ethane	Vinyl Chloride
ACTION LEVELS				17	ND
MW5A	20-Jul-88	WAI	UHL	320	210
MW5A	21-Jul-92	WAI	UHL	5	7
MW5A	08-Jul-93	WAI	UHL	3	9
MW5A	11-Jul-94	WAI	UHL	5	6
MW5A	17-Oct-95	WAI	UHL	3	7
MW5A (Dup)	17-Oct-95	WAI	UHL	3	7
MW5A	17-Apr-96	WAI	UHL	2	3
MW5A (Dup)	17-Apr-96	WAI	UHL	2	2
MW5A	15-Oct-96	WAI	UHL	1	3
MW5A (Dup)	15-Oct-96	WAI	UHL	1	3
MW5A	15-Apr-97	WAI	UHL	1	3
MW5A	28-Oct-97	WAI	UHL	<1	PP(0.7)
MW5A	06-Apr-98	WAI	UHL	1	2
MW5A	07-Oct-98	WAI	UHL	<1.0	<1.0
MW5A	28-Apr-99	WAI	UHL	<1.0	PP(0.4)
MW5A	27-Oct-99	WAI	UHL	<1.0	PP(0.6)
MW5A	04-Apr-00	WAI	UHL	<1.0	PP(0.5)
MW6	14-Dec-82	SERCO	MDH	0.6	—
MW6	14-Dec-82	SERCO	SERCO	—	—
MW6	11-Apr-83	SERCO	SERCO	—	—
MW6	11-Jul-83	SERCO	SERCO	—	—
MW6	18-Oct-83	SERCO	SERCO	—	—
MW6	29-May-85	MPCA	MDH	<0.20	—
MW6	24-Feb-86	MPCA	MDH	—	2
MW6	19-Aug-86	EAH	UHL	0.2	<10
MW6	24-Jun-87	EAH	UHL	0.2	44
MW6	11-Aug-87	EAH	UHL	2	32
MW6	20-Jul-88	WAI	UHL	<1	79
MW6	03-Apr-89	WAI	UHL	1	37
MW7A	22-Jun-87	EAH	UHL	<0.2	<5
MW7A	22-Jun-87	EAH	ALR	<0.3	<10
MW7A	05-Aug-87	EAH	UHL	<1	<1
MW7A	19-Jul-88	WAI	UHL	<1	<1
MW7A	06-Jul-89	WAI	UHL	<1	<1.0
MW7A	20-Jul-92	WAI	UHL	<1.0	<1.0
MW7A	07-Jul-93	WAI	UHL	<1.0	<1.0
MW7A	11-Jul-94	WAI	UHL	<1.0	<1.0
MW7A	16-Apr-96	WAI	UHL	<1.0	<1.0
MW7B	22-Jun-87	EAH	UHL	<0.2	<5
MW7B	05-Aug-87	EAH	UHL	<1	<1
MW7B	19-Jul-88	WAI	UHL	<1	<1
MW7B	06-Jul-89	WAI	UHL	<1	<1.0
MW7B	27-Sep-89	WAI	UHL	<1.0	<1.0
MW7B	18-Apr-90	WAI	UHL	<1.0	<1.0
MW7B	23-Jul-90	WAI	UHL	<1.0	<1.0
MW7B	24-Oct-90	WAI	UHL	<1.0	<1.0
MW7B	24-Apr-91	WAI	UHL	<1.0	<1.0
MW7B	23-Jul-91	WAI	UHL	<1.0	<1.0
MW7B	22-Oct-91	WAI	UHL	<1.0	<1.0
MW7B	06-Apr-92	WAI	UHL	<1.0	<1.0
MW7B	20-Jul-92	WAI	UHL	<1.0	<1.0
MW7B	27-Oct-92	WAI	UHL	<1.0	<1.0
MW7B	05-Apr-93	WAI	UHL	<1.0	<1.0
MW7B	07-Jul-93	WAI	UHL	<1.0	<1.0
MW7B	26-Oct-93	WAI	UHL	<1.0	<1.0
MW7B	26-Oct-93	MPCA	MDH	<0.2	<1.0
MW7B	06-Apr-94	WAI	UHL	<1.0	<1.0
MW7B	11-Jul-94	WAI	UHL	<1.0	<1.0
MW7B	03-Oct-94	WAI	UHL	<1.0	<1.0
MW7B	05-Apr-95	WAI	UHL	<1.0	<1.0
MW7B (Dup)	05-Apr-95	WAI	UHL	<1.0	<1.0
MW7B	16-Apr-96	WAI	UHL	<1.0	<1.0
MW7B	15-Apr-97	WAI	UHL	<1.0	<1.0
MW7B	06-Apr-98	WAI	UHL	<1.0	<1.0
MW8A	22-Jun-87	EAH	UHL	<0.2	<5
MW8A	05-Aug-87	EAH	UHL	<1	<1
MW8A	07-Jul-93	WAI	UHL	<1.0	<1.0
MW8A	11-Jul-94	WAI	UHL	<1.0	<1.0
MW8A	16-Apr-96	WAI	UHL	<1.0	<1.0
MW8A	27-Oct-99	WAI	UHL	<1.0	<1.0
MW8B	22-Jun-87	EAH	UHL	<0.2	<5
MW8B	05-Aug-87	EAH	UHL	<1	<1
MW8B	19-Jul-88	WAI	UHL	<1	<1
MW8B	25-Oct-88	WAI	UHL	<1	<1
MW8B	03-Apr-89	WAI	UHL	<1	<1
MW8B	06-Jul-89	WAI	UHL	<1	<1.0
MW8B	27-Sep-89	WAI	UHL	<1.0	<1.0
MW8B	17-Apr-90	WAI	UHL	<1.0	<1.0
MW8B	24-Jul-90	WAI	UHL	<1.0	<1.0
MW8B	23-Jul-91	WAI	UHL	<1.0	<1.0
MW8B	21-Jul-92	WAI	UHL	<1.0	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzd By	cis-1,2- Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
MW8B	10-Aug-93	WAI	UHL	<1.0	<1.0
MW8B	11-Jul-94	WAI	UHL	<1.0	<1.0
MW8B	16-Apr-96	WAI	UHL	<1.0	<1.0
MW8B (Dup)	16-Apr-96	WAI	UHL	<1.0	<1.0
MW8B	05-Apr-00	WAI	UHL	<1.0	<1.0
	17-Apr-01	WAI	UHL	<0.5	<0.5
MW8C	22-Jun-87	EAH	UHL	<0.2	<5
MW8C	05-Aug-87	EAH	UHL	<1	<1
MW8C	19-Jul-88	WAI	UHL	<1	<1
MW8C	25-Oct-88	WAI	UHL	<1	<1
MW8C	03-Apr-89	WAI	UHL	<1	<1
MW8C	06-Jul-89	WAI	UHL	<1	<1.0
MW8C	27-Sep-89	WAI	UHL	<1.0	<1.0
MW8C	17-Apr-90	WAI	UHL	<1.0	<1.0
MW8C	24-Jul-90	WAI	UHL	<1.0	<1.0
MW8C	23-Oct-90	WAI	UHL	<1.0	<1.0
MW8C	24-Apr-91	WAI	UHL	<1.0	<1.0
MW8C	23-Jul-91	WAI	UHL	<1.0	<1.0
MW8C	22-Oct-91	WAI	UHL	<1.0	<1.0
MW8C	06-Apr-92	WAI	UHL	<1.0	<1.0
MW8C	20-Jul-92	WAI	UHL	<1.0	<1.0
MW8C	27-Oct-92	WAI	UHL	<1.0	<1.0
MW8C	27-Oct-92	MPCA	MDH	<0.2	<1.0
MW8C	06-Apr-93	WAI	UHL	<1.0	<1.0
MW8C	10-Aug-93	WAI	UHL	<1.0	<1.0
MW8C	26-Oct-93	WAI	UHL	<1.0	<1.0
MW8C	06-Apr-94	WAI	UHL	<1.0	<1.0
MW8C (Dup)	06-Apr-94	WAI	UHL	<1.0	<1.0
MW8C	11-Jul-94	WAI	UHL	<1.0	<1.0
MW8C	03-Oct-94	WAI	UHL	<1.0	<1.0
MW8C	05-Apr-95	WAI	UHL	<1.0	<1.0
MW8C (Dup)	05-Apr-95	WAI	UHL	<1.0	<1.0
MW8C	16-Apr-96	WAI	UHL	<1.0	<1.0
MW8C	13-Apr-99	WAI	UHL	<1.0	<1.0
MW8C	05-Apr-00	WAI	UHL	<1.0	<1.0
MW8C (Dup)	05-Apr-00	WAI	UHL	<1.0	<1.0
MW8C	17-Apr-01	WAI	UHL	<0.5	<0.5
MW9A	23-Jun-87	EAH	UHL	<0.2	<5
MW9A	05-Aug-87	EAH	UHL	<1	<1
MW9A	05-Aug-87	EAH	ALR	<1	<2
MW9A	28-Oct-87	EAH	UHL	<1	<1
MW9A	14-Mar-88	EAH	ALR	<1	<0.5
MW9A	12-May-88	WAI	ALR	<1	<1
MW9A	12-May-88	MPCA	MDH	<0.2	—
MW9A	19-Jul-88	WAI	UHL	<1	<1
MW9A	25-Oct-88	WAI	UHL	<1	<1
MW9A	21-Jul-92	WAI	UHL	<1.0	<1.0
MW9A	07-Jul-93	WAI	UHL	<1.0	<1.0
MW9A	12-Jul-94	WAI	UHL	<1.0	PP (0.1)
MW9A (Dup)	12-Jul-94	WAI	UHL	<1.0	<1.0
MW9A	17-Apr-96	WAI	UHL	<1.0	<1.0
MW9A	15-Apr-97	WAI	UHL	<1.0	<1.0
MW9A	06-Apr-98	WAI	UHL	<1.0	<1.0
MW9A	31-Mar-99	WAI	UHL	<1.0	<1.0
MW9A	27-Oct-99	WAI	UHL	<1.0	<1.0
MW9B	23-Jun-87	EAH	UHL	<0.2	<5
MW9B	05-Aug-87	EAH	UHL	<1	<1
MW9B	28-Oct-87	EAH	UHL	<1	<1
MW9B	14-Mar-88	EAH	ALR	<1	<0.5
MW9B	12-May-88	MPCA	MDH	<0.2	—
MW9B	12-May-88	WAI	ALR	<1	<1
MW9B	19-Jul-88	MPCA	MDH	<0.2	—
MW9B	19-Jul-88	WAI	UHL	<1	<1
MW9B	25-Oct-88	WAI	UHL	<1	<1
MW9B	03-Apr-89	WAI	UHL	<1	<1
MW9B	06-Jul-89	WAI	UHL	<1	<1.0
MW9B	27-Sep-89	WAI	UHL	<1.0	<1.0
MW9B	18-Apr-90	WAI	UHL	<1.0	<1.0
MW9B	24-Jul-90	WAI	UHL	<1.0	<1.0
MW9B	24-Jul-91	WAI	UHL	<1.0	<1.0
MW9B	20-Jul-92	WAI	UHL	<1.0	<1.0
MW9B	07-Jul-93	WAI	UHL	<1.0	<1.0
MW9B	12-Jul-94	WAI	UHL	<1.0	<1.0
MW9B	17-Apr-96	WAI	UHL	<1.0	<1.0
MW9B	15-Apr-97	WAI	UHL	<1.0	<1.0
MW9B	06-Apr-98	WAI	UHL	<1.0	<1.0
MW9B (Dup. called MW12)	06-Apr-98	WAI	UHL	<1.0	<1.0
MW9B	31-Mar-99	WAI	UHL	<1.0	<1.0
MW9B	05-Apr-00	WAI	UHL	<1.0	1
MW9B	26-Sep-00	WAI	UHL	<1.0	1
MW9B(Dup)	26-Sep-00	WAI	UHL		
MW9B	17-Apr-00	WAI	UHL	1.1	1.6
MW9B	06-Nov-01	WAI	UHL	2	4

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzd By	cis-1,2- Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
MW9B	03-Apr-02	WAI	UHL	1.2	2.5
MW9B (Dup)	03-Apr-02	WAI	UHL	1.2	2.3
MW9B	16-Jul-02	WAI	EnChem	1.6	1.8
MW9B	16-Jul-02	WAI	UHL	<1.0	1.6
MW9B	30-Oct-02	WAI	EnChem	<1.0	1.1
MW9B	30-Apr-03	WAI	EnChem	<1.0	<1.0
MW9B	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW9C	23-Jun-87	EAH	UHL	<0.2	<5
MW9C	05-Aug-87	EAH	UHL	<1	<1
MW9C	28-Oct-87	EAH	ALR	<1	<2
MW9C	28-Oct-87	EAH	UHL	<1	<1
MW9C	14-Mar-88	EAH	ALR	<1	<0.5
MW9C	14-Mar-88	EAH	UHL	<1	<1
MW9C	12-May-88	WAI	ALR	<1	<1
MW9C	12-May-88	WAI	UHL	<1	<1
MW9C	12-May-88	MPCA	MDH	0.3	—
MW9C	19-Jul-88	MPCA	MDH	0.3	—
MW9C	19-Jul-88	WAI	UHL	<1	<1
MW9C	25-Oct-88	WAI	UHL	<1(5)	<1
MW9C	25-Oct-88	MPCA	MDH	<0.2	<0.5
MW9C	03-Apr-89	WAI	UHL	<1(5)	<1(5)
MW9C	03-Apr-89	MPCA	MDH	0.3	<0.5
MW9C	06-Jul-89	WAI	UHL	2	8
MW9C	27-Sep-89	WAI	UHL	2	4
MW9C	18-Apr-90	WAI	UHL	6	27
MW9C	24-Jul-90	WAI	UHL	<1.0	<1.0
MW9C	23-Oct-90	WAI	UHL	<1.0	<1.0
MW9C	24-Apr-91	WAI	UHL	<1.0	<1.0
MW9C	24-Jul-91	WAI	UHL	2	4
MW9C	22-Oct-91	WAI	UHL	1	<1.0
MW9C	06-Apr-92	WAI	UHL	<1.0	<1.0
MW9C	20-Jul-92	WAI	UHL	<1.0	PP
MW9C	27-Oct-92	WAI	UHL	<1.0	<1.0
MW9C	06-Apr-93	WAI	UHL	<1.0	<1.0
MW9C	10-Aug-93	WAI	UHL	<1.0	<1.0
MW9C (Dup)	10-Aug-93	WAI	UHL	<1.0	<1.0
MW9C	26-Oct-93	WAI	UHL	<1.0	<1.0
MW9C	06-Apr-94	WAI	UHL	<1.0	<1.0
MW9C	12-Jul-94	WAI	UHL	<1.0	<1.0
MW9C	03-Oct-94	WAI	UHL	<1.0	<1.0
MW9C	05-Apr-95	WAI	UHL	<1.0	<1.0
MW9C	17-Apr-96	WAI	UHL	<1.0	<1.0
MW9C	15-Apr-97	WAI	UHL	<1.0	<1.0
MW9C	06-Apr-98	WAI	UHL	<1.0	<1.0
MW9C	31-Mar-99	WAI	UHL	<1.0	<1.0
MW9C	05-Apr-00	WAI	UHL	<1.0	<1.0
MW9C	17-Apr-01	WAI	UHL	<1.0	<1.0
MW9C	03-Apr-02	WAI	UHL	<1.0	<1.0
MW9C	30-Apr-03	WAI	EnChem	<1.0	<1.0
MW9C (Dup)	30-Apr-03	WAI	EnChem	<1.0	<1.0
MW9C	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW10A	23-Jun-87	EAH	ALR	<0.3	<10
MW10A	23-Jun-87	EAH	UHL	<0.2	<5
MW10A	06-Aug-87	EAH	UHL	<1	<1
MW10A	20-Jul-88	WAI	UHL	<1	<1
MW10A	25-Oct-88	WAI	UHL	<1	<1
MW10A	07-Jul-93	WAI	UHL	<1.0	<1.0
MW10A	12-Jul-94	WAI	UHL	<1.0	<1.0
MW10A	17-Apr-96	WAI	UHL	<1.0	<1.0
MW10A	27-Oct-99	WAI	UHL	<1.0	<1.0
MW10A	04-Apr-00	WAI	UHL	<1.0	<1.0
MW10B	23-Jun-87	EAH	UHL	<0.2	<5
MW10B	06-Aug-87	EAH	UHL	<1	<1
MW10B	20-Jul-88	WAI	UHL	<1	<1
MW10B	25-Oct-88	WAI	UHL	<1	<1
MW10B	03-Apr-89	WAI	UHL	<1	<1
MW10B	05-Jul-89	WAI	UHL	<1	<1.0
MW10B	27-Sep-89	WAI	UHL	<1.0	<1.0
MW10B	18-Apr-90	WAI	UHL	<1.0	<1.0
MW10B	24-Jul-90	WAI	UHL	<1.0	<1.0
MW10B	23-Jul-91	WAI	UHL	<1.0	<1.0
MW10B	20-Jul-92	WAI	UHL	<1.0	<1.0
MW10B	07-Jul-93	WAI	UHL	<1.0	<1.0
MW10B	12-Jul-94	WAI	UHL	<1.0	<1.0
MW10B	17-Apr-96	WAI	UHL	<1.0	<1.0
MW10B	04-Apr-00	WAI	UHL	<1.0	<1.0
MW10B	17-Apr-01	WAI	UHL	<1.0	<1.0
MW10B	03-Apr-02	WAI	UHL	<1.0	<1.0
MW10B	30-Apr-03	WAI	EnChem	<1.0	<1.0
MW10B	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW10C	23-Jun-87	EAH	UHL	<0.2	<5
MW10C	06-Aug-87	EAH	UHL	<1	<1

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations: ug/L)**

Well	Date	Mon. By	Anlyzr By	cis-1,2-Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
MW10C	20-Jul-88	WAI	UHL	<1	<1
MW10C	25-Oct-88	WAI	UHL	<1	<1
MW10C	03-Apr-89	WAI	UHL	<1	<1
MW10C	05-Jul-89	WAI	UHL	<1	<1.0
MW10C	27-Sep-89	WAI	UHL	<1.0	<1.0
MW10C	18-Apr-90	WAI	UHL	<1.0	<1.0
MW10C	24-Jul-90	WAI	UHL	<1.0	<1.0
MW10C	23-Oct-90	WAI	UHL	<1.0	<1.0
MW10C	24-Apr-91	WAI	UHL	<1.0	<1.0
MW10C	23-Jul-91	WAI	UHL	<1.0	<1.0
MW10C	22-Oct-91	WAI	UHL	<1.0	<1.0
MW10C	06-Apr-92	WAI	UHL	<1.0	<1.0
MW10C	20-Jul-92	WAI	UHL	<1.0	<1.0
MW10C	27-Oct-92	WAI	UHL	<1.0	<1.0
MW10C	06-Apr-93	WAI	UHL	<1.0	<1.0
MW10C	07-Jul-93	WAI	UHL	<1.0	<1.0
MW10C	26-Oct-93	WAI	UHL	<1.0	<1.0
MW10C	06-Apr-94	WAI	UHL	<1.0	<1.0
MW10C	12-Jul-94	WAI	UHL	<1.0	<1.0
MW10C	03-Oct-94	WAI	UHL	<1.0	<1.0
MW10C	05-Apr-95	WAI	UHL	<1.0	<1.0
MW10C	17-Apr-96	WAI	UHL	<1.0	<1.0
MW10C	04-Apr-00	WAI	UHL	<1.0	<1.0
MW10C	17-Apr-01	WAI	UHL	<1.0	<1.0
MW10C(DUP SDS-1)	17-Apr-01	WAI	UHL	<1.0	<1.0
MW10C	03-Apr-02	WAI	UHL	<1.0	<1.0
MW10C	30-Apr-03	WAI	EnChem	<1.0	<1.0
MW10C	28-Apr-04	WAI	EnChem	<1.0	<1.0
MW11	01-May-90	WAI	UHL	<1.0	<1.0
MW11	09-May-90	WAI	UHL	<1.0	<1.0
MW11	13-Jun-90	WAI	UHL	<1.0	<1.0
MW11	24-Jul-90	WAI	UHL	<1.0	<1.0
MW11	24-Jul-90	MPCA	MDH	<0.2	<1.0
MW11	23-Oct-90	WAI	UHL	<1.0	<1.0
MW11	18-Dec-90	WAI	UHL	<1.0	<1.0
MW11	17-Jan-91	WAI	UHL	<1.0	<1.0
MW11	24-Apr-91	WAI	UHL	<1.0	<1.0
MW11	23-Jul-91	WAI	UHL	<1.0	<1.0
MW11	22-Oct-91	WAI	UHL	<1.0	<1.0
MW11	06-Apr-92	WAI	UHL	<1.0	<1.0
MW11	21-Jul-92	WAI	UHL	<1.0	<1.0
MW11	27-Oct-92	WAI	UHL	<1.0	<1.0
MW11	05-Apr-93	WAI	UHL	<1.0	<1.0
MW11	07-Jul-93	WAI	UHL	<1.0	<1.0
MW11	26-Oct-93	WAI	UHL	<1.0	<1.0
MW11	06-Apr-94	WAI	UHL	<1.0	<1.0
MW11	11-Jul-94	WAI	UHL	<1.0	<1.0
MW11	03-Oct-94	WAI	UHL	<1.0	<1.0
MW11	05-Apr-95	WAI	UHL	<1.0	<1.0
MW11	17-Oct-95	WAI	UHL	<1.0	<1.0
MW11	16-Apr-96	WAI	UHL	<1.0	<1.0
MW11	15-Oct-96	WAI	UHL	<1.0	<1.0
MW11	15-Apr-97	WAI	UHL	<1.0	<1.0
MW11 (Dup)	15-Apr-97	WAI	UHL	<1.0	<1.0
MW11	06-Apr-98	WAI	UHL	<1.0	<1.0
MW11	31-Mar-99	WAI	UHL	<1.0	<1.0
MW11	05-Apr-00	WAI	UHL	<1.0	<1.0
MW11	03-Apr-02	WAI	UHL	<1.0	<1.0
MW11	29-Apr-03	WAI	EnChem	<1.0	<1.0
MW11	28-Apr-04	WAI	EnChem	<1.0	<1.0
<u>RECOVERY WELL SYSTEM:</u>					
RWA	02-Oct-89	WAI	UHL	8	22
RWA	04-Oct-89	WAI	UHL	10	19
RWA	05-Oct-89	WAI	UHL	14	17
RWA	18-Apr-90	WAI	UHL	25	25
RWA	09-May-90	WAI	UHL	25	27
RWA	13-Jun-90	WAI	UHL	17	16
RWA	24-Jul-90	MPCA	MDH	20	5.1
RWA	24-Jul-90	WAI	UHL	15	7
RWA	23-Oct-90	WAI	UHL	13	8
RWA	14-Nov-90	WAI	UHL	13	9
RWA	18-Dec-90	WAI	UHL	11	8
RWA	17-Jan-91	MPCA	MDH	12	2.6
RWA	17-Jan-91	WAI	UHL	9.0	5
RWA	24-Apr-91	WAI	UHL	9.0	4
RWA	23-Jul-91	WAI	UHL	9.0	5
RWA (Dup)	23-Jul-91	WAI	UHL	9.0	5
RWA	21-Oct-91	WAI	UHL	7.0	3
RWA	28-Jan-92	CITY	UHL	8.0	3
RWA	06-Apr-92	WAI	UHL	7.0	3
RWA (Dup)	06-Apr-92	WAI	UHL	7.0	3
RWA	21-Jul-92	WAI	UHL	5.0	2
RWA (Dup)	21-Jul-92	WAI	UHL	4.0	1
RWA	27-Oct-92	WAI	UHL	4.0	1

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzr By	cis-1,2-Dichloroethene	Vinyl Chloride
ACTION LEVELS				17	ND
RWA (Dup)	27-Oct-92	WAI	UHL	4.0	1
RWA	19-Jan-93	CITY	UHL	3.0	1
RWA	05-Apr-93	WAI	UHL	3.0	1
RWA (Dup)	05-Apr-93	WAI	UHL	3.0	1
RWA	07-Jul-93	WAI	UHL	4.0	1
RWA (Dup)	07-Jul-93	WAI	UHL	5.0	1
RWA	26-Oct-93	WAI	UHL	3.0	1
RWA	26-Oct-93	MPCA	MDH	3.2	<1.0
RWA	24-Jan-94	CITY	UHL	3.0	1
RWA	06-Apr-94	WAI	UHL	3.0	3
RWA	12-Jul-94	WAI	UHL	2.0	PP (0.7)
RWA (Dup)	12-Jul-94	WAI	UHL	2.0	PP (0.6)
RWA	03-Oct-94	WAI	UHL	3.0	1
RWA	19-Jan-95	CITY	UHL	2.0	PP (0.4)
RWA	05-Apr-95	WAI	UHL	1.0	PP (0.5)
RWA	18-Jul-95	CITY	UHL	2.0	PP (0.5)
RWA	17-Oct-95	WAI	UHL	2.0	PP (0.6)
RWA	24-Jan-96	CITY	UHL	1.0	PP (0.6)
RWA	17-Apr-96	WAI	UHL	2.0	PP (0.5)
RWA	23-Jul-96	CITY	UHL	1.0	1
RWA (Dup)	23-Jul-96	CITY	UHL	1.0	1
RWA	15-Oct-96	WAI	UHL	1.0	PP (0.7)
RWA (Dup)	15-Oct-96	WAI	UHL	1.0	PP (0.7)
RWA	15-Oct-96	MPCA	MDH	1.2	0.40
RWA	22-Jan-97	CITY	UHL	1.0	PP (0.4)
RWA (Dup)	22-Jan-97	CITY	UHL	1.0	PP (0.3)
RWA	15-Apr-97	WAI	UHL	1.0	PP (0.3)
RWA	22-Jul-97	CITY	UHL	1.0	PP (0.6)
RWA	28-Oct-97	WAI	UHL	1.0	PP (0.9)
RWA	21-Jan-98	CITY	UHL	<1	PP (0.5)
RWA	06-Apr-98	WAI	UHL	1.0	PP (0.7)
RWA	14-Jul-98	CITY	UHL	1.0	PP (0.5)
RWA	07-Oct-98	WAI	UHL	<1.0	PP (0.7)
RWA	14-Jan-99	CITY	UHL	<1.0	<1.0
RWA	31-Mar-99	WAI	UHL	<1.0	PP (0.4)
RWA (Dup)	31-Mar-99	WAI	UHL	<1.0	PP (0.4)
RWA	14-Jul-99	CITY	UHL	<1.0	PP (0.5)
RWA	27-Oct-99	CITY	UHL	1.0	PP (0.3)
RWA	04-Apr-00	WAI	UHL	1.4	PP (0.3)
RWA	26-Sep-00	WAI	UHL	2.0	PP (0.2)
RWA	17-Apr-01	WAI	UHL	1.6	PP (0.3)
RWA	06-Nov-01	WAI	UHL	1.0	PP (0.2)
RWA	03-Apr-02	WAI	UHL	<1	PP (0.6)
RWA	16-Jul-02	WAI	EnChem	<1.0	<1.0
RWA	30-Oct-02	WAI	EnChem	<1.0	<0.1
RWA	21-Jan-03	CITY	EnChem	<1.0	<0.1
RWA	29-Apr-03	WAI	EnChem	<1.0	<1.0
RWA	07-Aug-03	CITY	EnChem	1.0	<1.0
RWA	12-Jan-04	CITY	EnChem	1.3	<1.0
RWA	29-Apr-04	WAI	EnChem	1.4	<1.0
RWA	28-Jul-04	CITY	EnChem	1.2	<1.0
RWA	12-Oct-04	CITY	EnChem	<1.0	<1.0
RWB	14-Nov-90	WAI	UHL	12	22
RWB	18-Dec-90	WAI	UHL	11	21
RWB	17-Jan-91	MPCA	MDH	13	10.5
RWB	17-Jan-91	WAI	UHL	11	13
RWB	24-Apr-91	WAI	UHL	10	5
RWB	23-Jul-91	WAI	UHL	9	6
RWB	22-Oct-91	WAI	UHL	6	4
RWB	28-Jan-92	CITY	UHL	5	3
RWB	06-Apr-92	WAI	UHL	5	2
RWB	21-Jul-92	WAI	UHL	3	1
RWB	27-Oct-92	WAI	UHL	3	1
RWB	19-Jan-93	CITY	UHL	2	1
RWB	01-Mar-93	CITY	UHL	2	1
RWB	07-Jul-93	WAI	UHL	1	1
RWB	26-Oct-93	WAI	UHL	2	1
RWB (Dup)	26-Oct-93	WAI	UHL	2	1
RWB	24-Jan-94	CITY	UHL	2	PP (0.8)
RWB	06-Apr-94	WAI	UHL	<1.0	<1.0
RWB	12-Jul-94	WAI	UHL	1	PP (0.3)
RWB	03-Oct-94	WAI	UHL	<1.0	<1.0
RWB	19-Jan-95	CITY	UHL	<1.0	PP (0.4)
RWB	05-Apr-95	WAI	UHL	<1.0	PP (0.4)
RWB	18-Jul-95	CITY	UHL	<1.0	PP (0.4)
RWB	17-Oct-95	WAI	UHL	1	PP (0.4)
RWB	24-Jan-96	CITY	UHL	<1.0	PP (0.3)
RWB	17-Apr-96	WAI	UHL	<1.0	<1.0
RWB	23-Jul-96	CITY	UHL	<1.0	PP (0.3)
RWB	15-Oct-96	WAI	UHL	<1.0	<1.0
RWB	22-Jan-97	CITY	UHL	<1.0	<1.0
RWB	15-Apr-97	WAI	UHL	<1.0	<1.0
RWB (Dup)	15-Apr-97	WAI	UHL	<1.0	<1.0
RWB	22-Jul-97	CITY	UHL	<1.0	PP (0.2)
RWB	28-Oct-97	WAI	UHL	<1.0	PP (0.3)

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations ug/L)**

Well	Date	Mon. By	Anlyzd By	cis-1,2-Dichloroethene	Vinyl Chloride
ACTION LEVELS				17	ND
RWB	21-Jan-98	CITY	UHL	<1.0	<1.0
RWB	06-Apr-98	WAI	UHL	<1.0	<1.0
RWB	14-Jul-98	CITY	UHL	<1.0	<1.0
RWB	07-Oct-98	WAI	UHL	<1.0	<1.0
RWB	14-Jan-98	CITY	UHL	<1.0	<1.0
RWB	31-Mar-99	WAI	UHL	<1.0	<1.0
RWB	14-Jul-99	CITY	UHL	<1.0	<1.0
RWB	27-Oct-99	CITY	UHL	<1.0	<1.0
RWB	04-Apr-00	WAI	UHL	<1.0	<1.0
RWB	17-Apr-01	WAI	UHL	<1.0	<1.0
RWB (DUP SDS-2)	03-Apr-02	WAI	UHL	<1.0	<1.0
RWB	16-Jul-02	WAI	EnChem	<1.0	<1.0
RWB	16-Jul-02	WAI	UHL	<1.0	<1.0
RWB	30-Oct-02	WAI	EnChem	<1.0	<1.0
RWB	30-Apr-03	WAI	EnChem	<1.0	<1.0
RWB	29-Apr-04	WAI	EnChem	<1.0	<1.0
RWC	14-Nov-90	WAI	UHL	<1.0	<1.0
RWC	18-Dec-90	WAI	UHL	<1.0	<1.0
RWC	17-Jan-91	MPCA	MDH	<0.2	<1.0
RWC	17-Jan-91	WAI	UHL	<1.0	<1.0
RWC	24-Apr-91	WAI	UHL	<1.0	<1.0
RWC	23-Jul-91	WAI	UHL	<1.0	<1.0
RWC	22-Oct-91	WAI	UHL	<1.0	<1.0
RWC	28-Jan-92	CITY	UHL	<1.0	<1.0
RWC	06-Apr-92	WAI	UHL	<1.0	<1.0
RWC	21-Jul-92	WAI	UHL	<1.0	<1.0
RWC	27-Oct-92	WAI	UHL	<1.0	<1.0
RWC	19-Jan-93	CITY	UHL	<1.0	<1.0
RWC	01-Mar-93	CITY	UHL	<1.0	<1.0
RWC	05-Apr-93	WAI	UHL	<1.0	<1.0
RWC	07-Jul-93	WAI	UHL	<1.0	<1.0
RWC	26-Oct-93	WAI	UHL	<1.0	<1.0
RWC	24-Jan-94	CITY	UHL	<1.0	<1.0
RWC	06-Apr-94	WAI	UHL	1	1
RWC	12-Jul-94	WAI	UHL	<1.0	<1.0
RWC	03-Oct-94	WAI	UHL	<1.0	<1.0
RWC	19-Jan-95	CITY	UHL	<1.0	<1.0
RWC	05-Apr-95	WAI	UHL	<1.0	<1.0
RWC	18-Jul-95	CITY	UHL	<1.0	<1.0
RWC	17-Oct-95	WAI	UHL	<1.0	<1.0
RWC	24-Jan-96	CITY	UHL	<1.0	<1.0
RWC	17-Apr-96	WAI	UHL	<1.0	<1.0
RWC	23-Jul-96	CITY	UHL	<1.0	<1.0
RWC	15-Oct-96	WAI	UHL	<1.0	<1.0
RWC	15-Oct-96	MPCA	MDH	<0.2	<0.2
RWC	22-Jan-97	CITY	UHL	<1.0	<1.0
RWC	15-Apr-97	WAI	UHL	<1.0	<1.0
RWC (Dup)	15-Apr-97	WAI	UHL	<1.0	<1.0
RWC	22-Jul-97	CITY	UHL	<1.0	<1.0
RWC	28-Oct-97	WAI	UHL	<1.0	<1.0
RWC	21-Jan-98	CITY	UHL	<1.0	<1.0
RWC	06-Apr-98	WAI	UHL	<1.0	<1.0
SPRAY AREA B	14-Nov-90	WAI	UHL	<1.0	<1.0
SPRAY AREA B	18-Dec-90	WAI	UHL	<1.0	<1.0
SPRAY AREA B	17-Jan-91	WAI	UHL	1	<1.0
SPRAY AREA B	24-Apr-91	WAI	UHL	<1.0	<1.0
SPRAY AREA B	23-Jul-91	WAI	UHL	<1.0	<1.0
SPRAY AREA B	22-Oct-91	WAI	UHL	<1.0	<1.0
SPRAY AREA B	28-Jan-92	CITY	UHL	<1.0	<1.0
SPRAY AREA B	06-Apr-92	WAI	UHL	<1.0	<1.0
SPRAY AREA B	21-Jul-92	WAI	UHL	<1.0	<1.0
SPRAY AREA B	27-Oct-92	WAI	UHL	<1.0	<1.0
SPRAY AREA B	19-Jan-93	CITY	UHL	<1.0	PP(0.2)
SPRAY AREA B	01-Mar-93	CITY	UHL	<1.0	<1.0
SPRAY AREA B	08-Jul-93	WAI	UHL	<1.0	<1.0
SPRAY AREA B	26-Oct-93	WAI	UHL	<1.0	<1.0
SPRAY AREA B	24-Jan-94	CITY	UHL	<1.0	<1.0
SPRAY AREA B	06-Apr-94	WAI	UHL	<1.0	<1.0
SPRAY AREA B	12-Jul-94	WAI	UHL	<1.0	<1.0
SPRAY AREA B	03-Oct-94	WAI	UHL	<1.0	<1.0
SPRAY AREA B	19-Jan-95	CITY	UHL	<1.0	<1.0
SPRAY AREA B	05-Apr-95	WAI	UHL	<1.0	<1.0
SPRAY AREA B	18-Jul-95	CITY	UHL	<1.0	<1.0
SPRAY AREA B	17-Oct-95	WAI	UHL	<1.0	<1.0
SPRAY AREA B	24-Jan-96	CITY	UHL	<1.0	<1.0
SPRAY AREA B	17-Apr-96	WAI	UHL	<1.0	<1.0
SPRAY AREA B	15-Oct-96	WAI	UHL	<1.0	<1.0
SPRAY AREA B	15-Apr-97	WAI	UHL	<1.0	<1.0
SPRAY AREA B	28-Oct-97	WAI	UHL	<1.0	<1.0
SPRAY AREA B	06-Apr-98	WAI	UHL	<1.0	<1.0
SPRAY AREA B	07-Oct-98	WAI	UHL	<1.0	<1.0
SPRAY AREA B	31-Mar-99	WAI	UHL	<1.0	<1.0
SPRAY AREA B	03-Apr-02	WAI	UHL	<1.0	<1.0
SPRAY AREA B	29-Apr-03	WAI	EnChem	<1.0	<1.0

1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

TABLE 1

**Water Quality Data Summary**  
**Former Windom Municipal Dump (Concentrations, ug/L)**

Well	Date	Mon. By	Anlyzsd By	cis-1,2- Dichloro ethene	Vinyl Chloride
ACTION LEVELS				17	ND
MAIN SPRAY AREA	02-Oct-89	WAI	UHL	<1.0	1
MAIN SPRAY AREA	04-Oct-89	WAI	UHL	<1.0	1
MAIN SPRAY AREA	05-Oct-89	WAI	UHL	<1.0	<1(5)
MAIN SPRAY AREA	09-May-90	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	13-Jun-90	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	24-Jul-90	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	24-Oct-90	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	14-Nov-90	WAI	UHL	1.0	<1.0
MAIN SPRAY AREA	18-Dec-90	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	17-Jan-91	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	24-Apr-91	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	23-Jul-91	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	22-Oct-91	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	28-Jan-92	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	06-Apr-92	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	21-Jul-92	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	27-Oct-92	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	27-Oct-92	MPCA	MDH	<0.2	<1.0
MAIN SPRAY AREA	19-Jan-93	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	05-Apr-93	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	08-Jul-93	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	26-Oct-93	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	24-Jan-94	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	06-Apr-94	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	12-Jul-94	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	03-Oct-94	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	19-Jan-95	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	05-Apr-95	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	18-Jul-95	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	17-Oct-95	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	24-Jan-96	CITY	UHL	<1.0	<1.0
MAIN SPRAY AREA	17-Apr-96	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	15-Oct-96	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	15-Apr-97	WAI	UHL	<1.0	<1.0
MAIN SPRAY AREA	28-Oct-97	WAI	UHL	<1.0	<1.0

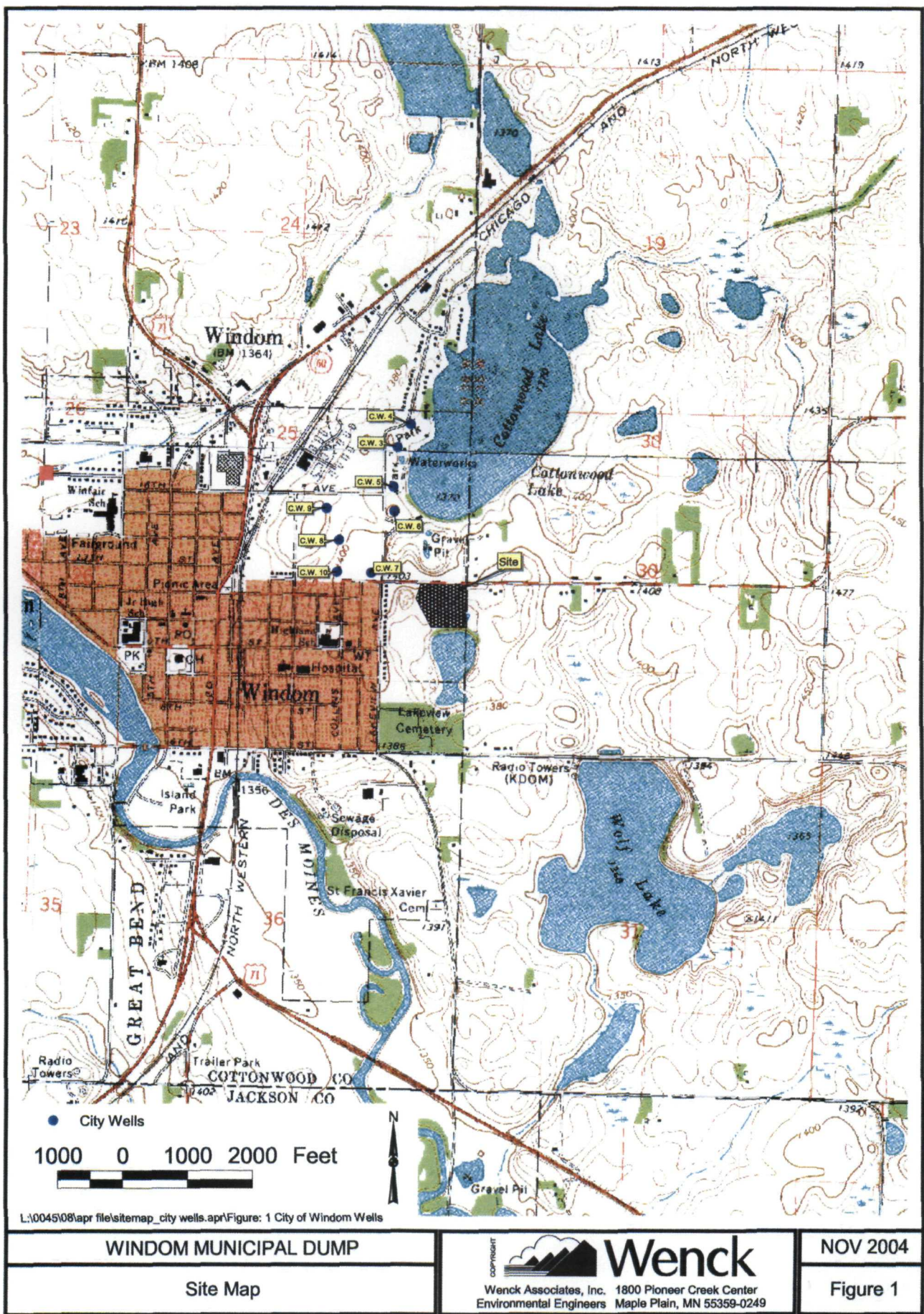
1) Blank contaminated with chloroform. 2) Blank contaminated with methylene chloride. 3) Blank contaminated with trichloroethane. 4) Not quantitated. 5) Peak present, Estimated Concentration Below Practical Quantitation Limits.

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## Figures

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CITY WELL 9  
CITY WELL 8  
CITY WELL 10

CITY WELL 7

TO CITY WELL 6 AND  
WATER TREATMENT  
BUILDING

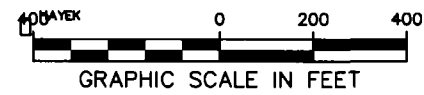
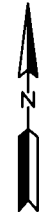
13th ST.  
LAKEVIEW AVE.  
10th ST.  
PROPERTY LINE  
MW9B  
MW9C  
MW9A  
RWA  
MW10A  
MW10B  
MW10C  
MW1  
RWB  
MW8A  
MW8B  
MW8C  
MW5A  
MW5  
MW4  
MW2  
WELLER  
MORPHEW  
13th ST.

PONDS

COTTONWOOD LAKE

SEC. 25 R 36 W  
SEC. 30 R 35 W  
RESIDENCE

TOWNSHIP ROAD



LEGEND

- ⊕ CITY WELL
- ⊞ RECOVERY WELL
- + MONITORING WELL
- ⊞ MANHOLE
- FENCE

COPYRIGHT



**Wenck**  
Wenck Associates, Inc.  
Environmental Engineers

1800 Pioneer Creek Center P.O. BOX 428  
Maple Plain, MN 55359-0428

M: 0045/045Year.dwg

NOV 2004

Figure 1

WINDOM MUNICIPAL DUMP

Site Detail Map

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## **Attachment 1**

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### **List of Documents Reviewed**

## **List of Documents Reviewed**

1. Wenck Associates, Inc., March 1989, Remedial Action Plan. Former Windom Municipal Landfill.
2. Minnesota Pollution Control Agency, April 1989, Record of Decision. Former Windom Municipal Landfill.
3. Minnesota Pollution Control Agency, January 1995, Five-Year Review Report. Windom Dump Site.
4. Wenck Associates, Inc., May 1998, Annual Evaluation Report. Prepared for City of Windom.
5. Wenck Associates, Inc., June 1999, Former Windom Municipal Landfill Five-Year Review and 1998-1999 Annual Evaluation Report. Prepared for City of Windom.
6. Wenck Associates, Inc., May 2000, Semi Annual Monitoring Report. Prepared for City of Windom.
7. Wenck Associates, Inc., May 2001, Annual Monitoring Report. Prepared for City of Windom.
8. Wenck Associates, Inc., October 2001, Quarterly Sampling Report. Prepared for City of Windom.
9. Wenck Associates, Inc., January 2002, Quarterly Sampling Report. Prepared for City of Windom.
10. Wenck Associates, Inc., June 2002, Quarterly Sampling Report. Prepared for City of Windom.
11. Wenck Associates, Inc., November 2002, Quarterly Sampling Report. Prepared for City of Windom.
12. Wenck Associates, Inc., June 2003, Quarterly Sampling Report. Prepared for City of Windom.
13. Wenck Associates, Inc., October 2003, Quarterly Sampling Report. Prepared for City of Windom.
14. Wenck Associates, Inc., June 2004, Quarterly Sampling Report. Prepared for City of Windom.

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## **Attachment 2**

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### **Site Inspection Checklist**

# Site Inspection Checklist

I. SITE INFORMATION	
<b>Site name:</b> Windom Municipal Dump	<b>Date of inspection:</b> 11-22-04
<b>Location and Region:</b> MN EPA Region 5	<b>EPA ID:</b> MND980034516*
<b>Agency, office, or company leading the Five-Year Review:</b> Minnesota Pollution Control Agency	<b>Weather/temperature:</b> Partly sunny/40 deg. F
<b>Remedy Includes:</b> (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Landfill cover/containment  <input checked="" type="checkbox"/> Access controls  <input checked="" type="checkbox"/> Institutional controls  <input checked="" type="checkbox"/> Groundwater pump and treatment  <input type="checkbox"/> Surface water collection and treatment            Other _____         </div> <div style="width: 50%;"> <input checked="" type="checkbox"/> Monitored natural attenuation  <input type="checkbox"/> Groundwater containment  <input type="checkbox"/> Vertical barrier walls         </div> </div>	
<b>Attachments:</b> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<b>1. O&amp;M site manager</b> <u>Mike Haugen – Water and Wastewater Superintendent</u> <b>11-22-04</b>	
Name	Title
Date	
Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone    Phone no. <u>507-831-6138</u> Problems, suggestions; <input type="checkbox"/> Report attached	
<b>2. O&amp;M staff</b> _____	
Name	Title
Date	
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone    Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached	



3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Minnesota Pollution Control Agency

Contact Kurt Schroeder Superfund 2 651-296-8593  
                     Name                    Title                    Date                    Phone no.

Problems; suggestions; ☐ Report attached: \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_  
                     Name                    Title                    Date                    Phone no.

Problems; suggestions; ☐ Report attached \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_  
                     Name                    Title                    Date                    Phone no.

Problems; suggestions; ☐ Report attached: \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_  
                     Name                    Title                    Date                    Phone no.

Problems; suggestions; ☐ Report attached \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

4. **Other interviews (optional)** ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	<b>O&amp;M Documents</b> <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	<b>Site-Specific Health and Safety Plan</b> <input type="checkbox"/> Contingency plan/emergency response plan <input checked="" type="checkbox"/> N/A Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
3.	<b>O&amp;M and OSHA Training Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
4.	<b>Permits and Service Agreements</b> <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
5.	<b>Gas Generation Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
6.	<b>Settlement Monument Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A
7.	<b>Groundwater Monitoring Records</b> Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A
8.	<b>Leachate Extraction Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A



9.	<b>Discharge Compliance Records</b> <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A																																																																								
10.	<b>Daily Access/Security Logs</b> Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A																																																																								
<b>IV. O&amp;M COSTS</b>																																																																										
1.	<b>O&amp;M Organization</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> State in-house  <input checked="" type="checkbox"/> PRP in-house  <input type="checkbox"/> Federal Facility in-house  <input type="checkbox"/> Other _____         </div> <div> <input type="checkbox"/> Contractor for State  <input checked="" type="checkbox"/> Contractor for PRP  <input type="checkbox"/> Contractor for Federal Facility         </div> </div>																																																																									
2.	<b>O&amp;M Cost Records</b> <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached  <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 20%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td colspan="3"></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3"></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3"></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3"></td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> </tr> </table>		From _____	To _____					Date	Date				<input type="checkbox"/> Breakdown attached				Total cost			From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date								Total cost			From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date								Total cost			From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date								Total cost		
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3.	<b>Unanticipated or Unusually High O&amp;M Costs During Review Period</b> Describe costs and reasons:  _____ _____ _____ _____																																																																									

<b>V. ACCESS AND INSTITUTIONAL CONTROLS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
<b>A. Fencing</b>			
1.	<b>Fencing damaged</b> <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks <u>Fencing was torn just east of MW-11.</u>		
<b>B. Other Access Restrictions</b>			
1.	<b>Signs and other security measures</b> <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A		
<b>C. Institutional Controls (ICs)</b>			
1.	<b>Implementation and enforcement</b> Site conditions imply ICs not properly implemented <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Site conditions imply ICs not being fully enforced <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A  Type of monitoring (e.g., self-reporting, drive by) <u>Driveby</u> Frequency <u>Weekly</u> Responsible party/agency PRP _____ Contact <u>Mike Haugen – Water and Wastewater Superintendent 507-831-6138</u>		
	Name	Title	Date      Phone no.
	Reporting is up-to-date <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Reports are verified by the lead agency <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A  Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Other problems or suggestions: <input type="checkbox"/> Report attached _____ _____ _____ _____		
2.	<b>Adequacy</b> <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A Remarks _____		

<b>D. General</b>		
1.	<b>Vandalism/trespassing</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident
2.	<b>Land use changes on site</b> Remarks _____	<input checked="" type="checkbox"/> N/A
3.	<b>Land use changes off site</b> Remarks _____	<input checked="" type="checkbox"/> N/A
<b>VI. GENERAL SITE CONDITIONS</b>		
<b>A. Roads</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	<b>Roads damaged</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate
<b>B. Other Site Conditions</b>		
Remarks _____ _____ _____ _____ _____		
<b>VII. LANDFILL COVERS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
<b>A. Landfill Surface</b>		
1.	<b>Settlement</b> (Low spots) Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Settlement not evident
2.	<b>Cracks</b> Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Cracking not evident

3.	<b>Erosion</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Erosion not evident	
4.	<b>Holes</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Holes not evident	
5.	<b>Vegetative Cover</b> <input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input checked="" type="checkbox"/> No signs of stress Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	<b>Alternative Cover (armored rock, concrete, etc.)</b> <input checked="" type="checkbox"/> N/A Remarks _____		
7.	<b>Bulges</b> Areal extent _____ Height _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Bulges not evident	
8.	<b>Wet Areas/Water Damage</b> <input checked="" type="checkbox"/> Wet areas/water damage not evident <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <input type="checkbox"/> Wet areas   <input type="checkbox"/> Ponding   <input type="checkbox"/> Seeps   <input type="checkbox"/> Soft subgrade         </div> <div style="width: 30%;"> <input type="checkbox"/> Location shown on site map  <input type="checkbox"/> Location shown on site map  <input type="checkbox"/> Location shown on site map  <input type="checkbox"/> Location shown on site map         </div> <div style="width: 30%;">           Areal extent _____            Areal extent _____            Areal extent _____            Areal extent _____         </div> </div> Remarks _____		
9.	<b>Slope Instability</b> <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____		

<b>B. Benches</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	<b>Flows Bypass Bench</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
2.	<b>Bench Breached</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
3.	<b>Bench Overtopped</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
<b>C. Letdown Channels</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	<b>Settlement</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of settlement
2.	<b>Material Degradation</b> Material type _____ Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of degradation
3.	<b>Erosion</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of erosion
4.	<b>Undercutting</b> Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of undercutting
5.	<b>Obstructions</b> Type _____ <input type="checkbox"/> Location shown on site map      Areal extent _____ Size _____ Remarks _____	<input checked="" type="checkbox"/> No obstructions

6.	<b>Excessive Vegetative Growth</b> <input checked="" type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input checked="" type="checkbox"/> Location shown on site map ( <b>Figure 1</b> )    Areal extent <u>&lt;0.1 acres</u> Remarks <u>Small trees growing in cap in drainage channel.</u>	Type <u>Trees</u>
<b>D. Cover Penetrations</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	<b>Gas Vents</b> <input type="checkbox"/> Active <input type="checkbox"/> Passive <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____	
2.	<b>Gas Monitoring Probes</b> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____	
3.	<b>Monitoring Wells (within surface area of landfill)</b> <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____	
4.	<b>Leachate Extraction Wells</b> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____	
5.	<b>Settlement Monuments</b> <input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input checked="" type="checkbox"/> N/A Remarks _____	

<b>E. Gas Collection and Treatment</b>		Applicable	<input type="checkbox"/> N/A
1.	<b>Gas Treatment Facilities</b> <input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____		
2.	<b>Gas Collection Wells, Manifolds and Piping</b> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____		
3.	<b>Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)</b> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
<b>F. Cover Drainage Layer</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Outlet Pipes Inspected</b> <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____		
2.	<b>Outlet Rock Inspected</b> <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____		
<b>G. Detention/Sedimentation Ponds</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Siltation</b> Areal extent _____ Depth _____ <input type="checkbox"/> N/A <input type="checkbox"/> Siltation not evident Remarks _____		
2.	<b>Erosion</b> Areal extent _____ Depth _____ <input type="checkbox"/> Erosion not evident Remarks _____		
3.	<b>Outlet Works</b> <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____		
4.	<b>Dam</b> <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____		

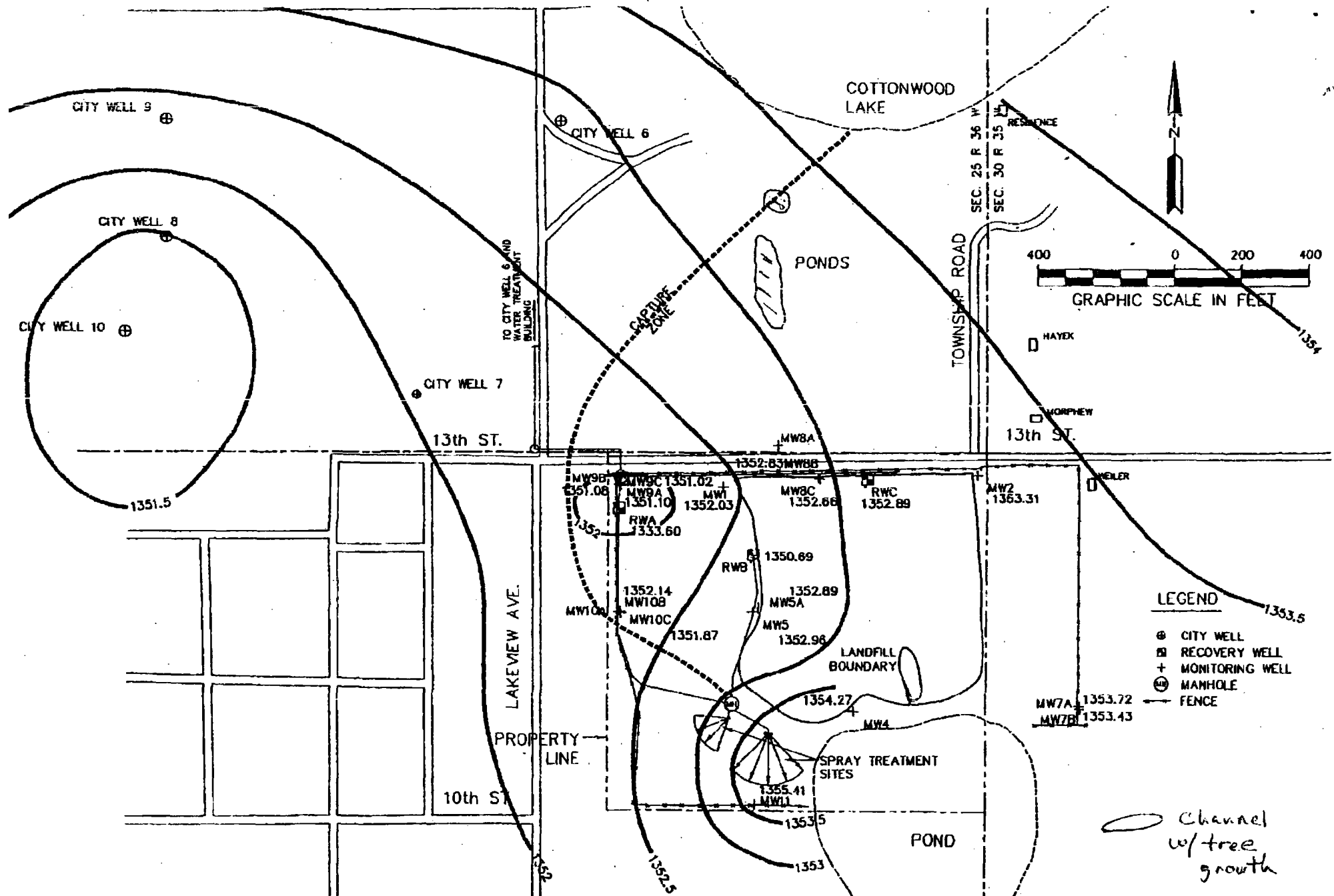
<b>H. Retaining Walls</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Deformations</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
	Horizontal displacement _____	Vertical displacement _____	
	Rotational displacement _____		
	Remarks _____		
<hr/>			
2.	<b>Degradation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
	Remarks _____		
<hr/>			
<b>I. Perimeter Ditches/Off-Site Discharge</b>		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Siltation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
	Areal extent _____	Depth _____	
	Remarks _____		
<hr/>			
2.	<b>Vegetative Growth</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
	<input type="checkbox"/> Vegetation does not impede flow		
	Areal extent _____	Type _____	
	Remarks _____		
<hr/>			
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
	Areal extent _____	Depth _____	
	Remarks _____		
<hr/>			
4.	<b>Discharge Structure</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks _____		
<hr/>			
<b>VIII. VERTICAL BARRIER WALLS</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Settlement</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Areal extent _____	Depth _____	
	Remarks _____		
<hr/>			
2.	<b>Performance Monitoring</b>	Type of monitoring _____	
	<input type="checkbox"/> Performance not monitored		
	Frequency _____	<input type="checkbox"/> Evidence of breaching	
	Head differential _____		
	Remarks _____		
<hr/>			



C. Treatment System		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Treatment Train</b> (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____  <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input checked="" type="checkbox"/> Others <u>Natural</u> <u>Attenuation</u> _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____  		
2.	<b>Electrical Enclosures and Panels</b> (properly rated and functional) <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____  		
3.	<b>Tanks, Vaults, Storage Vessels</b> <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____  		
4.	<b>Discharge Structure and Appurtenances</b> <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____  		
5.	<b>Treatment Building(s)</b> <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____  		
6.	<b>Monitoring Wells</b> (pump and treatment remedy) Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>RWA/RWB need locks</u> _____  		

<b>D. Monitoring Data</b>	
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input checked="" type="checkbox"/> Contaminant concentrations are declining
<b>D. Monitored Natural Attenuation</b>	
1.	<b>Monitoring Wells</b> (natural attenuation remedy) X Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition X All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____
<b>X. OTHER REMEDIES</b>	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
<b>XI. OVERALL OBSERVATIONS</b>	
<b>A. Implementation of the Remedy</b>	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).  <u>Remedy is functioning and effective in containing contaminant plume and preventing further leachate migration to the groundwater. Remedy is effective in protecting contamination migration to nearby municipal wells.</u>	
<b>B. Adequacy of O&amp;M</b>	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.  <u>Current and long term protectiveness for the site through O&amp;M procedures are protective of human health and the environment</u>	

<b>C.</b>	<b>Early Indicators of Potential Remedy Problems</b>
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.	
<u>No issues.</u>	
<b>D.</b>	<b>Opportunities for Optimization</b>
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.	
<u>None</u>	



CITY OF WINDOM

Site Map with Existing Capture Zone (January 5, 1999)



# Wenck

1800 Pioneer Creek Center P.O. BOX 428  
Maple Plain, MN 55359-0428

JUNE 1991

Figure 1

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## **Attachment 3**

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### **Site Photographs**

City of Windom—Former Landfill  
Berm Construction—Fall 2002



Berm and road, looking south

10/21/02



Berm and road, looking north

10/21/02





Erosion area near MW5, looking east, pre-repair.



Following placement of clay, looking east toward MW5.





Geotextile and riprap placement, looking west of MW5.



Geotextile and riprap placement, looking east of MW5.



# City of Windom Part I Wellhead Protection Plan

**Wenck File #0045-05**

Prepared for:

**CITY OF WINDOM**  
444 - 9th Street  
Windom, Minnesota 56101

Prepared by:

**WENCK ASSOCIATES, INC.**  
1800 Pioneer Creek Center  
P.O. Box 249  
Maple Plain, Minnesota 55359-0249  
(763) 479-4200

February 2003



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## **1.0 Introduction**

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This report documents the delineation of the wellhead protection area (WHPA), vulnerability assessment, and criteria for delineating the drinking water supply management area (DWSMA). The delineation was performed in accordance with rules for preparing and implementing wellhead protection measured for public water supply wells that were prepared by the Minnesota Department of Health (MDH) (MR4720.5100 to 4720.5580).

The results were a cooperative effort between Bruce Olsen (MDH), City staff, and the City's consulting firm of Wenck Associates, Incorporated (Wenck).

The WHPA was determined by using the analytical element model MLAEM (version 5.02). The DWSMA incorporates all properties that were partially or completely within the WHPA. Figure 1 shows the boundaries of the WHPAs and the DWSMA.

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## **2.0 Hydrogeologic Setting and Wellhead Protection Area Delineation**

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This section documents the delineation of the wellhead protection area (WHPA) for the City of Windom, Minnesota. Figure 2 shows the active municipal wells (City Wells 3, 4, 5, 6, 8, 9 and 10). City Well 7 is used as an emergency backup well. The WHPA was determined in accordance with Minnesota Rules, Parts 4720.5100 to 4720.5590, regarding WHP measures for public water supply wells.

### **2.1 HYDROGEOLOGIC SETTING**

The primary sources used herein for hydrogeologic information are: 1) geologic cross-sections constructed based on boring logs for city wells and nearby geologic logs, 2) geologic cross-sections obtained from the U.S. Geological Survey through personal contacts with Mr. Tim Cowdery, and 3) Water Resources of the Des Moines River Watershed, Southwestern Minnesota, U.S. Geological Survey, Hydrologic Investigations Atlas HA-553, H.W. Anderson, Jr. et al., 1976.

#### **2.1.1 Regional Hydrogeology**

According to Anderson et al. (1976), the uppermost bedrock in the region near Windom is Cretaceous shale and siltstone (with some sandstone), directly overlying the Sioux Quartzite, which is of Precambrian age. The bedrock in this region is generally not the preferred aquifer because water-yielding units are localized and produce only moderate supplies. The top of the bedrock generally occurs at elevation 1,000 feet (NGVD) near Windom. The thickness of overlying glacial deposits ranges from about 200 to 400 feet in the Windom vicinity.

The major regional aquifer occurs in the glacial drift. Anderson et al. (1976) and Adolphson (1983) identify a glacial outwash aquifer that runs beneath Windom along the Des Moines River corridor, and regionally discharges to the Des Moines River. U.S. Geological Survey investigators have recently observed that the outwash within and in the immediate vicinity of Windom's municipal wellfield is distinctly "cleaner" (freer of fine sediments) than other parts of the regional aquifer (Tim Cowdery, personal communication, February 27, 2001). Anderson et al. (1976) show the aquifer surrounded laterally in the Windom area by the Altamont end moraine, which is mostly silty, calcareous till.

Kanivetsky (1979) estimates groundwater recharge due to direct infiltration from rainfall in the Windom area to be between 0.5 and 1.9 inches. Recharge from lakes is estimated from runoff estimates to be between 2 and 6 inches per year (Kanivetsky, 1979). According to Anderson et al. (1976), discharge along reaches of the Des Moines River (i.e., groundwater seepage into the river) is estimated to average between 0.4 and 0.7 cubic feet per second (cfs) per mile.

### **2.1.2 Local Hydrogeology**

Glacial outwash (predominately sand and gravel) ranges in thickness to greater than 100 feet in the Windom municipal wellfield. This unconfined aquifer is bounded below by thick (greater than 100 feet) clay, and on the sides by glacial till which forms the buried valley walls (see Figures 2 – 4).

The glacial outwash aquifer is recharged via infiltrating rainfall, interaction with surface water features, and flow from the surrounding till. Of particular significance to groundwater levels and flow direction near the City's wellfield are Cottonwood Lake, Warren Lake, the Des Moines River, and other surface water features. In the wellfield vicinity, the elevation of the base of the aquifer is approximately 1,270 feet (NGVD), and the saturated thickness is about 50 to 70 feet.

The hydraulic conductivity and transmissivities for the aquifer in the main wellfield vicinity (cleaner outwash) were estimated by pumping tests. The following table lists the different pumping tests and typical results for each:

Test Conducted By, Date	Well	Transmissivity (ft <sup>2</sup> /day)	Saturated Thickness (ft)	Hydraulic Conductivity (ft/day)
Bonestroo, 1974	CW-6	23,000	80	290
Wenck, 1989	RW-A	19,000	85	220
Liesch, 1990	Test Well	18,000	62	290
Wenck, 1997	CW-9	1,500	50	30*
Wenck, 1998	CW-10	25,000	82	310

*\*Wenck (1997) attributed the low hydraulic conductivity observed at CW9 to inadequate development of the well.*

Wenck (1997) estimated the hydraulic conductivity for the aquifer in the main wellfield vicinity to be 205 ft/day based on the above-listed hydraulic conductivities and through the calibration of a groundwater model requested by the Minnesota Department of Natural Resources (MDNR). Based on an average saturated thickness in the main wellfield vicinity of 70 ft, the aquifer transmissivity is taken to be 14,350 ft<sup>2</sup>/day.

Based on the U.S. Geological Survey (Tim Cowdery, personal communication, February 27, 2001), the hydraulic conductivity of the aquifer outside the main wellfield vicinity is lower than that within the main wellfield since the outwash in the immediate vicinity of the wellfield is distinctly "cleaner."

## 2.2 CITY WATER SUPPLY

Windom obtains its water supply from seven wells (City Wells 3, 4, 5, 6, 8, 9 and 10) as shown on Figure 2. The City has one additional well (City Well 7) designated for backup use only.

2

<b>Well Number</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>Five-Year Maximum</b>
<b>CW3</b>	30,657,200	31,880,800	40,859,500	22,669,300	33,771,300	40,859,500
<b>CW4</b>	34,169,300	45,545,200	38,010,000	23,410,900	29,504,500	45,545,200
<b>CW5</b>	32,842,900	37,982,900	33,132,700	16,727,100	27,534,800	37,982,900
<b>CW6</b>	33,785,800	54,280,000	39,241,100	34,423,900	39,926,800	54,280,000
<b>CW8</b>	80,588,100	83,778,900	69,255,800	65,201,000	65,518,900	83,778,900
<b>CW9</b>	—	—	11,747,800	21,334,900	25,665,200	25,665,200
<b>CW10</b>	—	—	46,734,200	118,833,400	119,149,600	119,149,600
<b>Total</b>	212,043,300	253,467,800	278,981,100	302,600,500	341,071,100	407,261,100

The City is currently permitted with the MDNR to pump 420,000,000 gallons. The projected water use takes into account population growth, an arrangement to supply water to the Red Rock Rural Water System, and the addition of the new corn processing plant in Bingham Lake.

## 2.3 CRITERIA USED TO DELINEATE THE WHPA

### 2.3.1 Daily Volume of Water Pumped

For purposes of WHPA delineation, the projected annual water use is used in the groundwater model, except for CW3, CW4, CW5, and CW6, where the five-year maximum water use was used because it was higher than the projected water use. The following table lists the projected and modeled annual flows in gallons:

Well Number	Projected Annual Flows	Modeled Flows
CW3	40,000,000	40,859,500
CW4	30,000,000	45,545,200
CW5	30,000,000	37,982,900
CW6	40,000,000	54,280,000
CW8	100,000,000	100,000,000
CW9	40,000,000	40,000,000
CW10	140,000,000	140,000,000
<b>Total</b>	<b>420,000,000</b>	<b>458,667,600</b>



### **2.3.2 Aquifer Transmissivity**

The aquifer hydraulic conductivity is taken to be 205 ft/day in the main wellfield vicinity. Based on an average aquifer saturated thickness of 70 ft, the aquifer transmissivity is 14,350 ft<sup>2</sup>/day.

### **2.3.3 Groundwater Flow Field**

The groundwater flow field is primarily driven by areal recharge, discharge via municipal wells, and discharge to the Des Moines River. As shown on Figure B-2, the groundwater flows from the north/northeast toward the Des Moines River in the vicinity of the City of Windom. The average groundwater hydraulic gradient ranges from 0.0015 to 0.003 ft/ft as shown on Figure B-2.

### **2.3.4 Flow Boundaries**

The aquifer lateral flow boundaries (extent of aquifer) are based on the glacial deposit map obtained from Anderson et al. (1976) and modified after discussions with Tim Cowdery with the U.S. Geological Survey. Vertically, the aquifer is underlain by more than 100 feet of clay.

The bed resistance for Cottonwood Lake, Warren Lake, Wolf Lake, and the Cemetery Pond was based on Wenck (1997). Wenck (1997) documents the incorporation of comments from the Minnesota Department of Health, the Minnesota Pollution Control Agency, and the Minnesota Department of Natural Resources into the groundwater flow model published by Wenck (1996). Figures 2 and 3 show the aquifer and the underlying clay formations.

### **2.3.5 Time of Travel**

The WHPA corresponds to the 10-year capture zone of the municipal wells, based on the modeled flows shown in Section 2.3.1.

## **2.4 WELLHEAD PROTECTION AREA DELINEATION**

### **2.4.1 Groundwater Model**

The wellhead protection area for Windom was delineated using the MLAEM model (Version 5.02). MLAEM is based on the analytic element method, which is a technique for modeling groundwater flow in two and three dimensions. It is particularly suitable for modeling flow in large domains, and was originally developed for two-dimensional modeling of regional groundwater flow.

The MLAEM model allows for the specification of uniform background flow, pumping wells, and uniform recharge, which could represent infiltration due to rainfall. It also allows the specification of linesinks, which can be used to represent streams that interact with an aquifer.

### **2.4.2 Model Inputs**

The model was based on a site-specific coordinate system where MW-7 represents the origin (coordinates: 0,0). The model was set up to include the City of Windom water supply wells. The extent of the unconfined aquifer was based on the geological cross-sections (Figures 3 and 4) and maps supplied by the USGS (Tim Cowdery, Personal Communications, 2001).

The MLAEM inputs include the following aquifer and flow field specifications:

- Base elevation 1270 ft NGVD
- Hydraulic conductivity 205 ft/day
- Porosity 0.25
- Total infiltration (uniform recharge) of 1.9 inches/year or  $4.4 \times 10^{-4}$  ft/day
- Reference Point Coordinates:  $-1.652 \times 10^6$ ,  $-2.376 \times 10^2$  (arbitrary, far-field)
- Reference Point Elevation: 1450 ft

The model input file is included in Appendix B. The appendix also includes graphs showing the model inputs and outputs (Figures B-1 and B-2). An electronic copy of the model input and output files (including model calibration files) is also attached.

#### **2.4.3 Model Sensitivity Analysis**

The model was run under two more hydraulic conductivities (155 and 255 ft/day) to test the model sensitivity to the hydraulic conductivity. The shape and extent of the groundwater stream lines were not significantly different from those of the calibrated model (hydraulic conductivity = 205 ft/day).

The electronic model input files for the sensitivity analysis are also attached.

#### **2.4.4 Surface Watershed Component**

Because the municipal wellfield is recharged by surface water, any area that readily contributes surface water to the 10-year modeled capture zone has been added to the WHPA. The surface watershed was determined by a review of the topographic map and was performed with input from the City of Windom, DNR, Cottonwood County, and MDH staff. The surface water component to the WHPA is detailed in Figure 5.

#### **2.4.5 Wellhead Protection Area**

The WPHA was delineated using MLAEM based on the 10-year capture zone of City Wells and the surface water component contributing to that area. The WPHA is shown on Figure 5.

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## **3.0 Vulnerability Assessment and DWSMA Delineation**

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This section documents the vulnerability assessments of the wells and drinking water supply management area for the public water supply system operated by the City of Windom. This assessment was performed in accordance with rules (Minnesota Rule 4720-5210) for preparing and implementing wellhead protection measures for public water supply wells.

### **3.1 WELL VULNERABILITY**

The vulnerability of City wells was determined by evaluating available information on the geology and well construction.

- Based on a review of the local geology, there is no known condition that threatens well integrity.
- A review of logs (Appendix A) shows casing material identified in all but one well (Windom #3). Well construction information indicates that proper materials were installed and the construction is non-vulnerable.
- The MDH Well Vulnerability Assessments for each of the municipal wells were reviewed. It was determined that of the eight wells (Nos. 3A, 4, 5, 6, 7, 8, 9, and 10) only wells 5, 7, and 8 are considered vulnerable. The MDH has developed a database of community and non-community non-transient public water supply wells in Minnesota that stores information pertinent to well vulnerability and rates the vulnerability of individual wells. A score is calculated for each well based on factors such as well construction, geology at the well site and chemical data. Higher scores correlate to greater perceived vulnerability. A numeric cut-off is used to differentiate vulnerable from non-vulnerable wells (MDH, 1993). In certain cases, the system identifies vulnerable wells based on the presence of contamination

such as nitrate-nitrogen in excess of 10 mg/l, or young (post-1953) water as indicated by the presence of 1 tritium unit or greater in the well water. The results of this assessment for the above-mentioned City wells are described below. Printouts from the MDH vulnerability database are included in Appendix C.

City of Windom wells Nos. 5, 7, and 8 were determined to be relatively vulnerable to contamination from activities at the land surface. This evaluation is based on factors such as the geologic sensitivity at these sites. The geologic sensitivity of the surficial glacial outwash aquifer is high because no low-permeability materials, such as clay or till, that might slow the vertical migration of contaminants at the land surface overlie the majority of this site.

### **3.2 VULNERABILITY OF THE DRINKING WATER SUPPLY MANAGEMENT AREA**

The vulnerability of the DWSMA for the City of Windom was determined by evaluating available information on geologic materials overlying the aquifers and the groundwater flow model.

Delineation of the wellhead protection area includes two components 1) the portion of the outwash channel aquifer included in the capture zones for the city wells, and 2) the surface water runoff area that provides recharge to the outwash channel aquifer (Figure 5). The vulnerability of these two areas differs because the channel aquifer is not present in most of the surface water runoff area. Here, clay-rich glacial deposits are present and surface water does not readily move vertically to recharge groundwater resources. Therefore, the composition of the glacial deposits within the DWSMA was evaluated to determine where clay-rich versus highly permeable sediments occurred below the soil horizon.

The Cottonwood County soil survey was used to provide additional detail regarding the composition of the glacial deposits within the DWSMA. The MDNR has prepared geologic

sensitivity ratings for the soil classifications described in the county soil surveys that were prepared by the Natural Resources Conservation Service (formerly the U.S. Soil Conservation Service). The MDNR sensitivity ratings were applied to the soils present within the DWSMA to prepare the vulnerability assessment for 1) the well capture zone area, 2) the areas where the outwash channel aquifer is present beyond the capture zones, and 3) the surface water runoff area. The results are shown in Figures 6 and 7.

The vulnerability of the area where the outwash channel aquifer is present is designated high because there appears to be no laterally persistent layers of fine-grained geologic materials to retard or prevent the vertical movement of water-borne contaminants. Elsewhere, the vulnerability of the DWSMA is designated as low because clay-rich glacial deposits are the predominant sediment type. Sand and gravel bodies may occur within these deposits, but are likely to be very localized and not in direct contact with the outwash channel aquifer.

### **3.3 DELINEATION OF THE DRINKING WATER SUPPLY MANAGEMENT AREA**

The area encompassed by combining the boundaries of the well capture zones and the surface water runoff component defines the wellhead protection area. The purpose for designating the DWSMA is to provide the public with clear boundaries of the protection area. The DWSMA boundaries must match those of the wellhead protection area as closely as possible using the following identifiable features:

- Center lines of highways, streets, roads, or railroad right-of-ways;
- Section and quarter sectioning lines from the US Public Land Survey;
- Property or fence lines
- The center of public drainage systems;
- Public utility service lines; or
- Political boundaries.

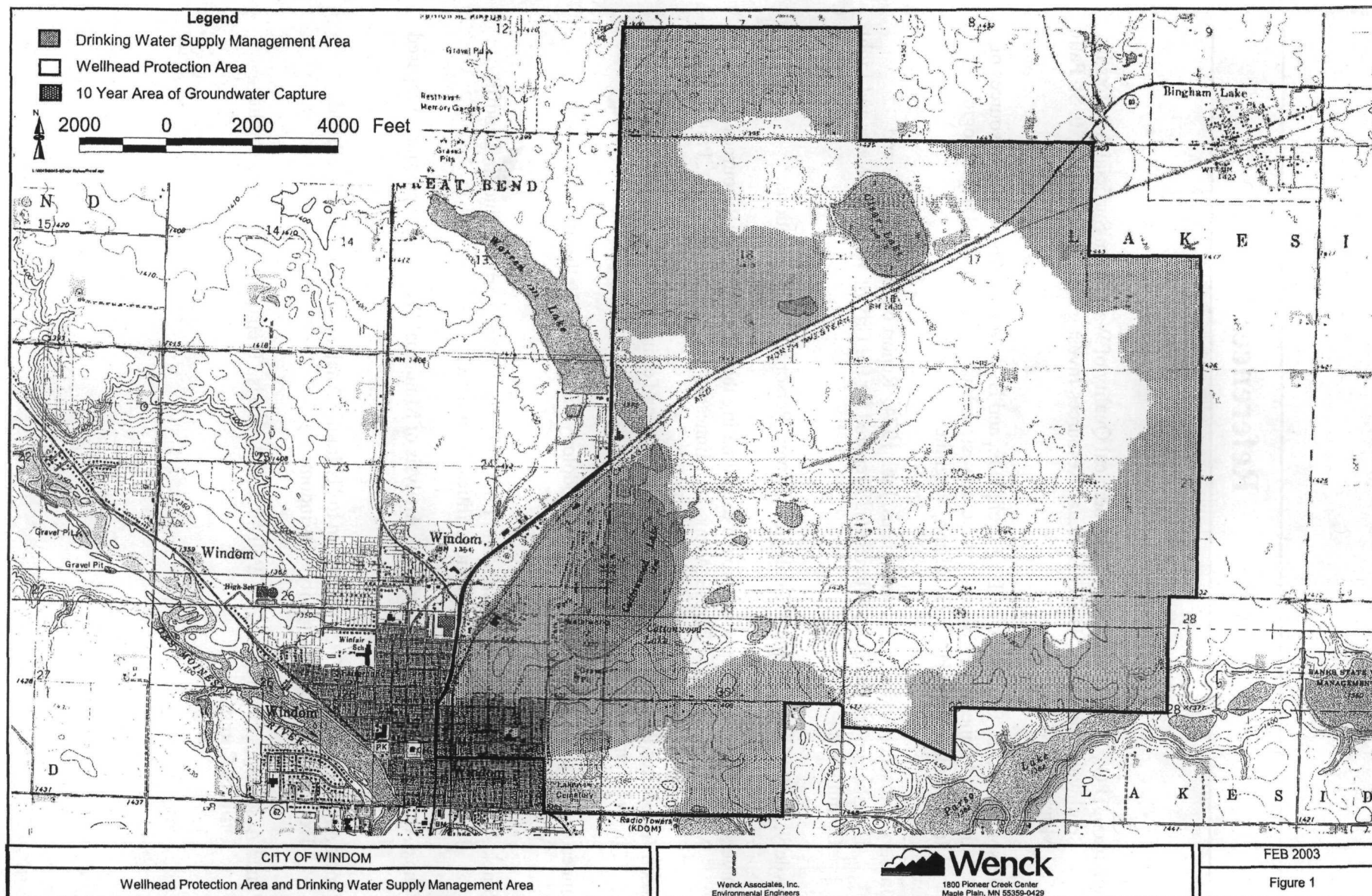
City staff assisted with defining the boundaries for the DWSMA. The DWSMA incorporates all properties that were partially or completely within the WHPA. The DWSMA is shown in Figure 1.

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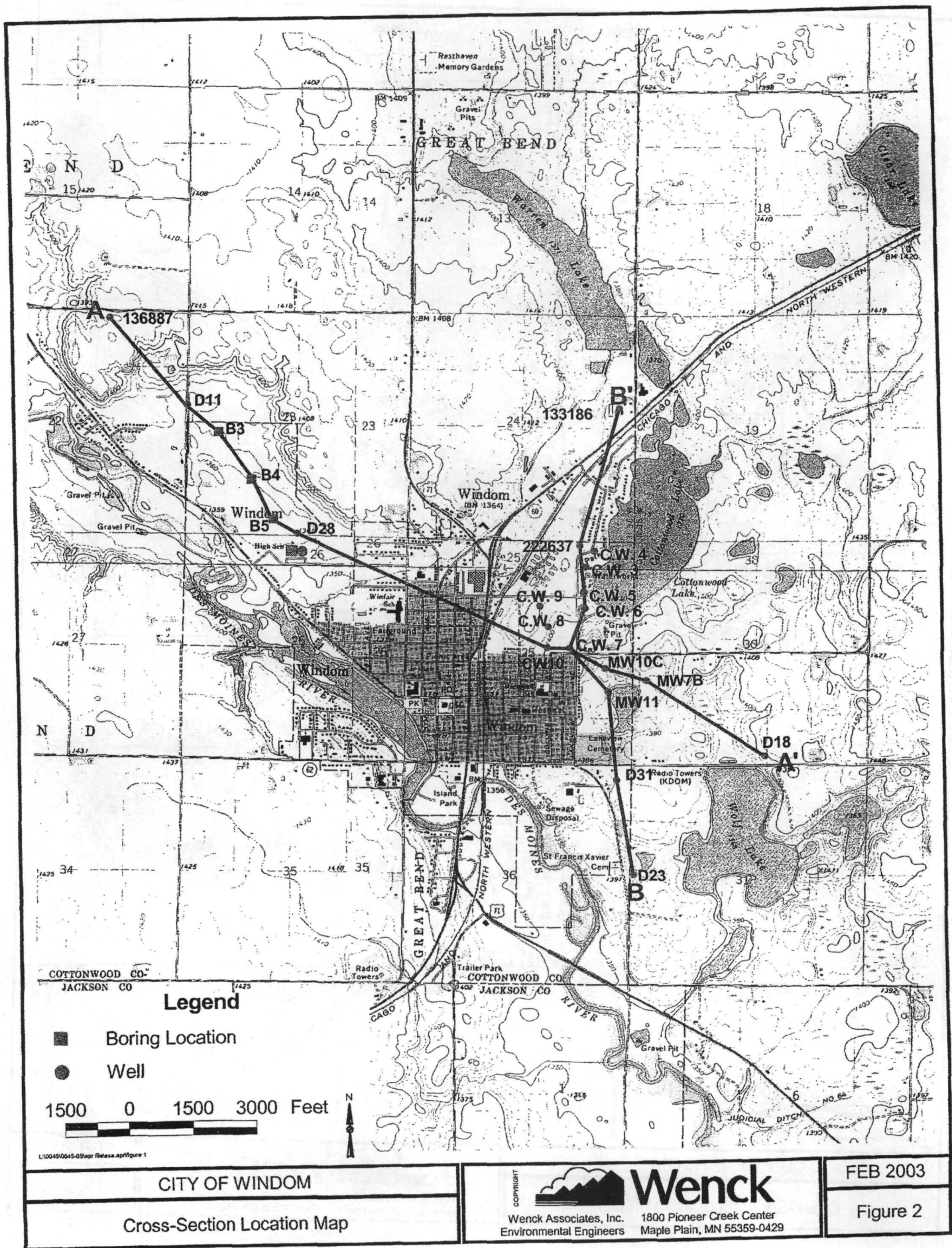
## 4.0 References

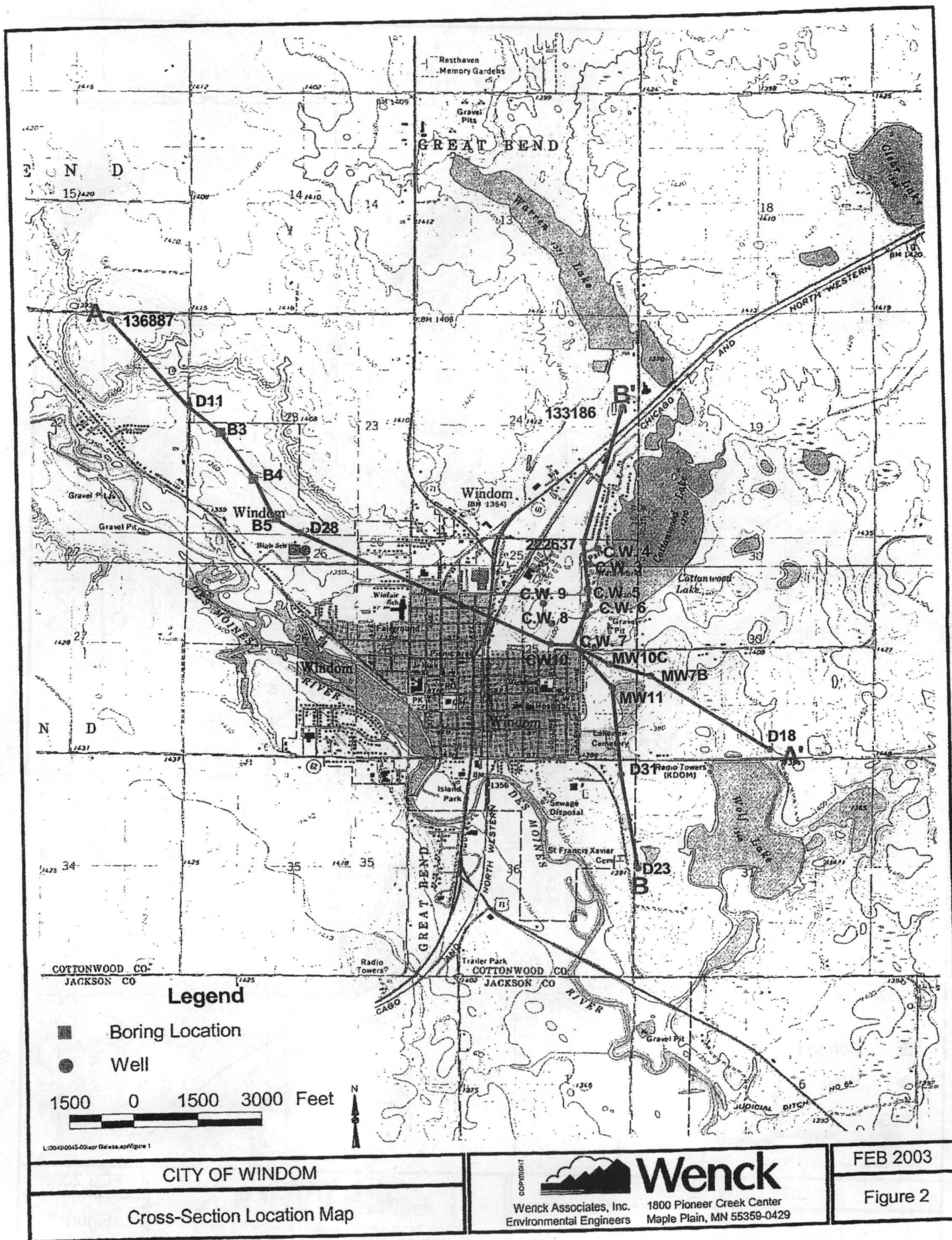
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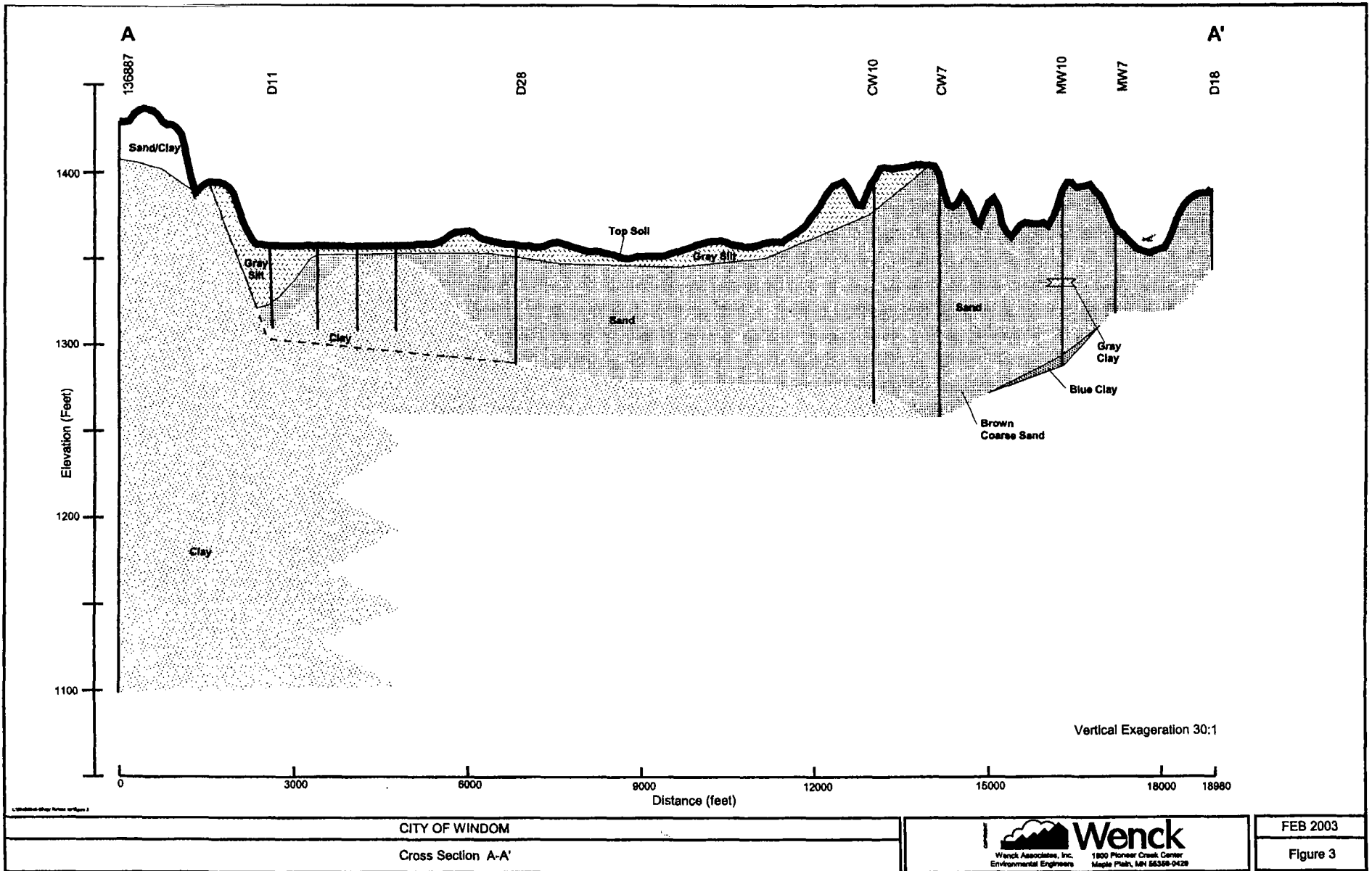
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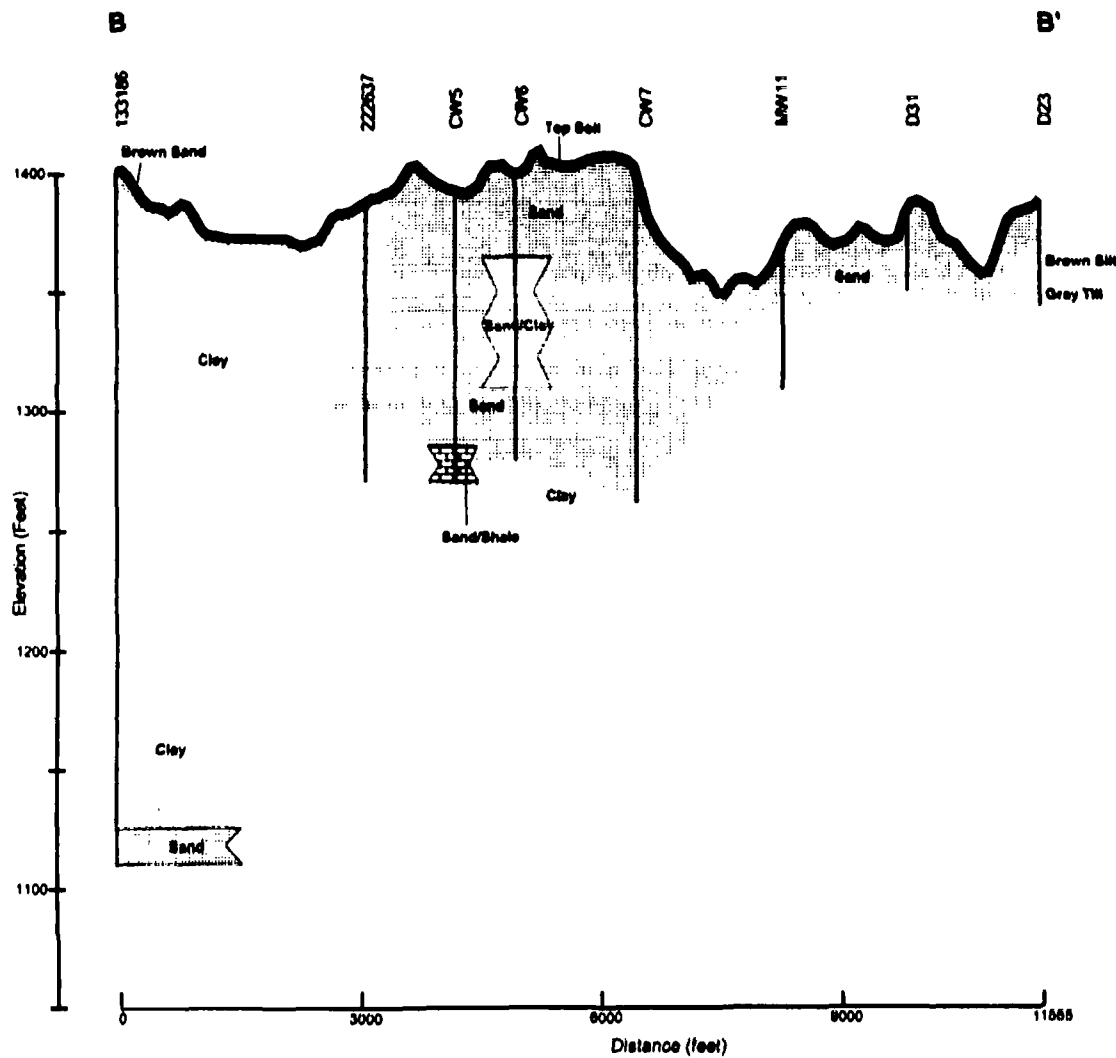












Vertical Exaggeration 30:1

CITY OF WINDOM

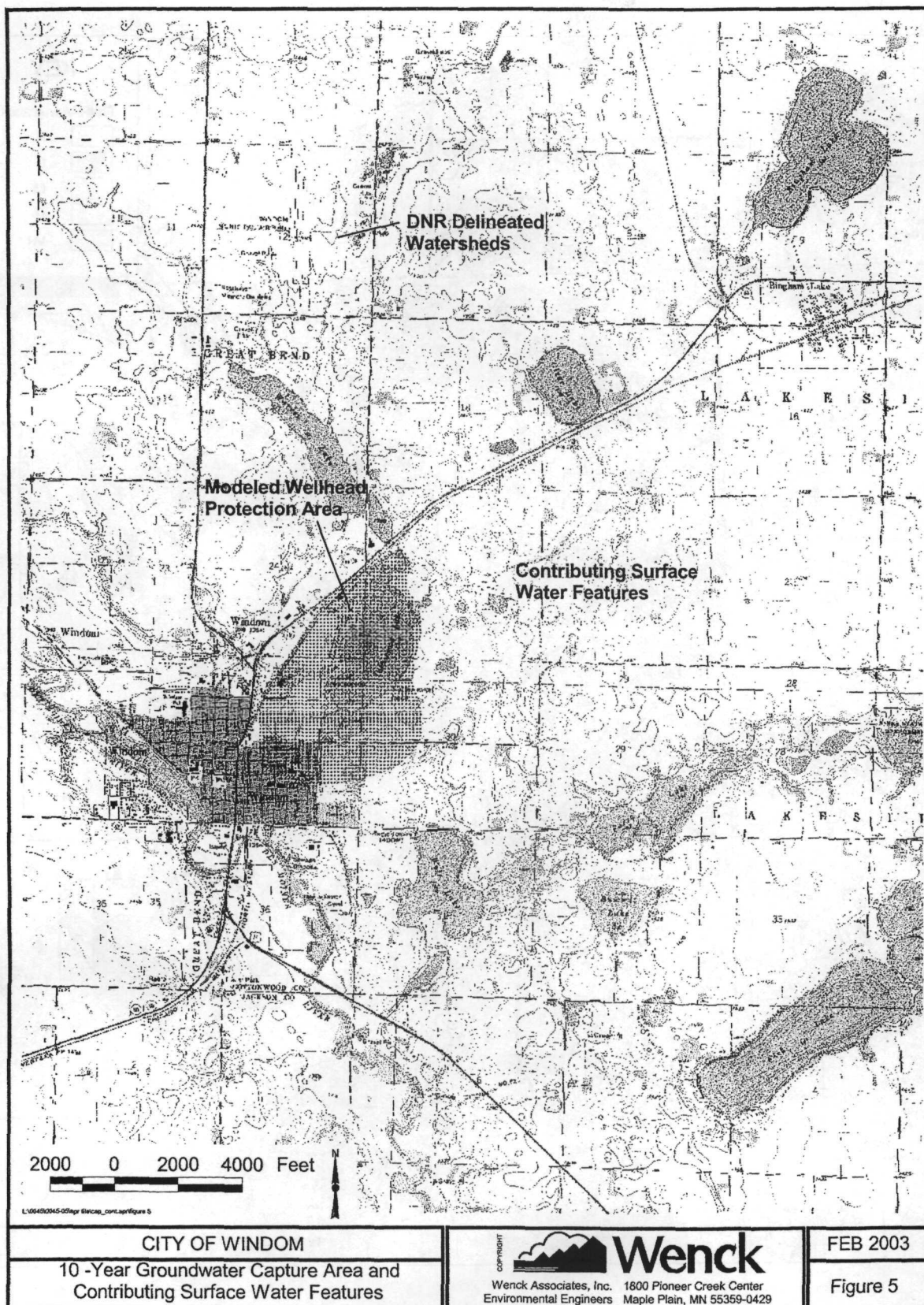
Cross Section B-B'

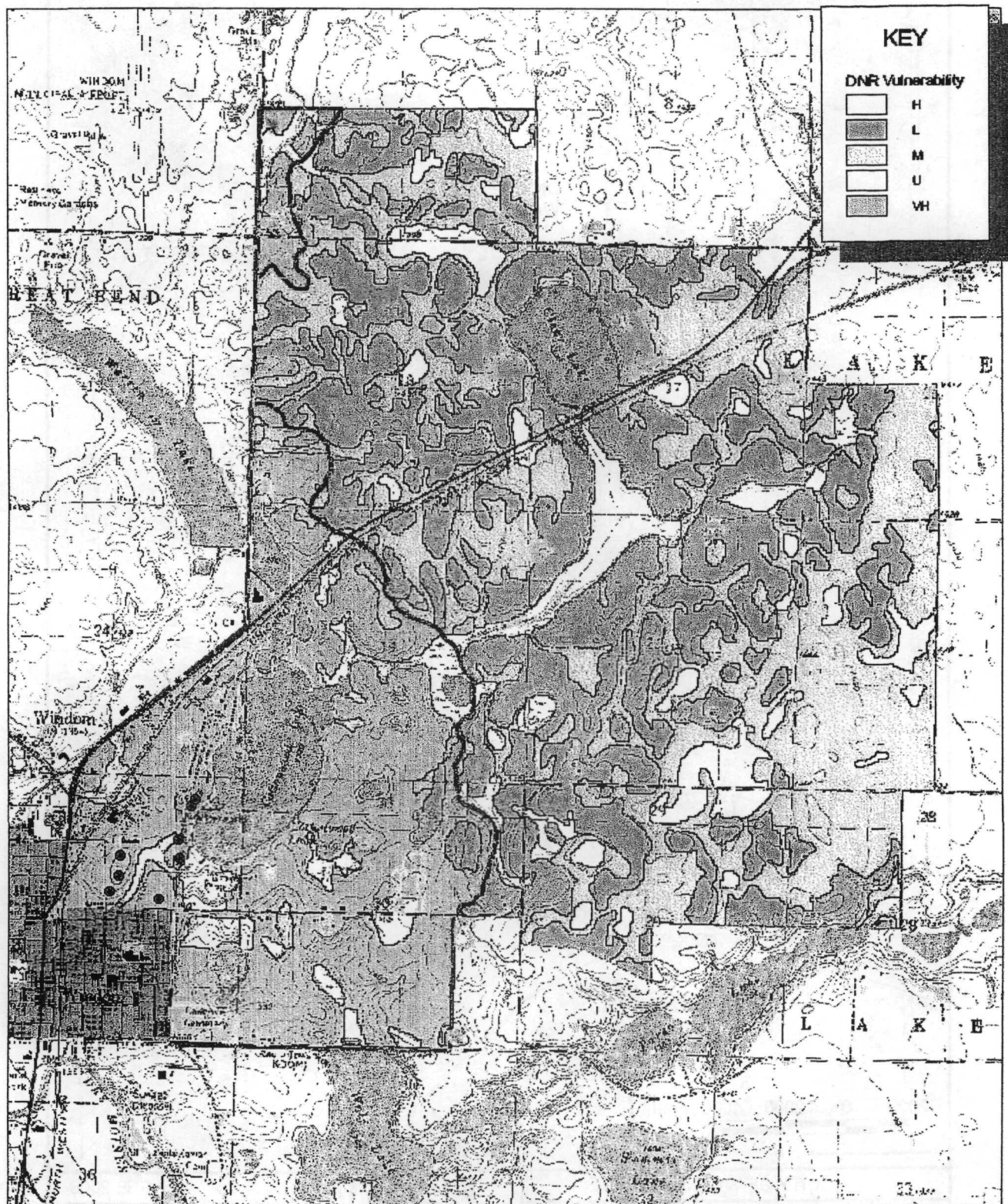


FEB 2003

Figure 4







City of Windom

DNR Vulnerability Ratings Taken From County Soil Survey

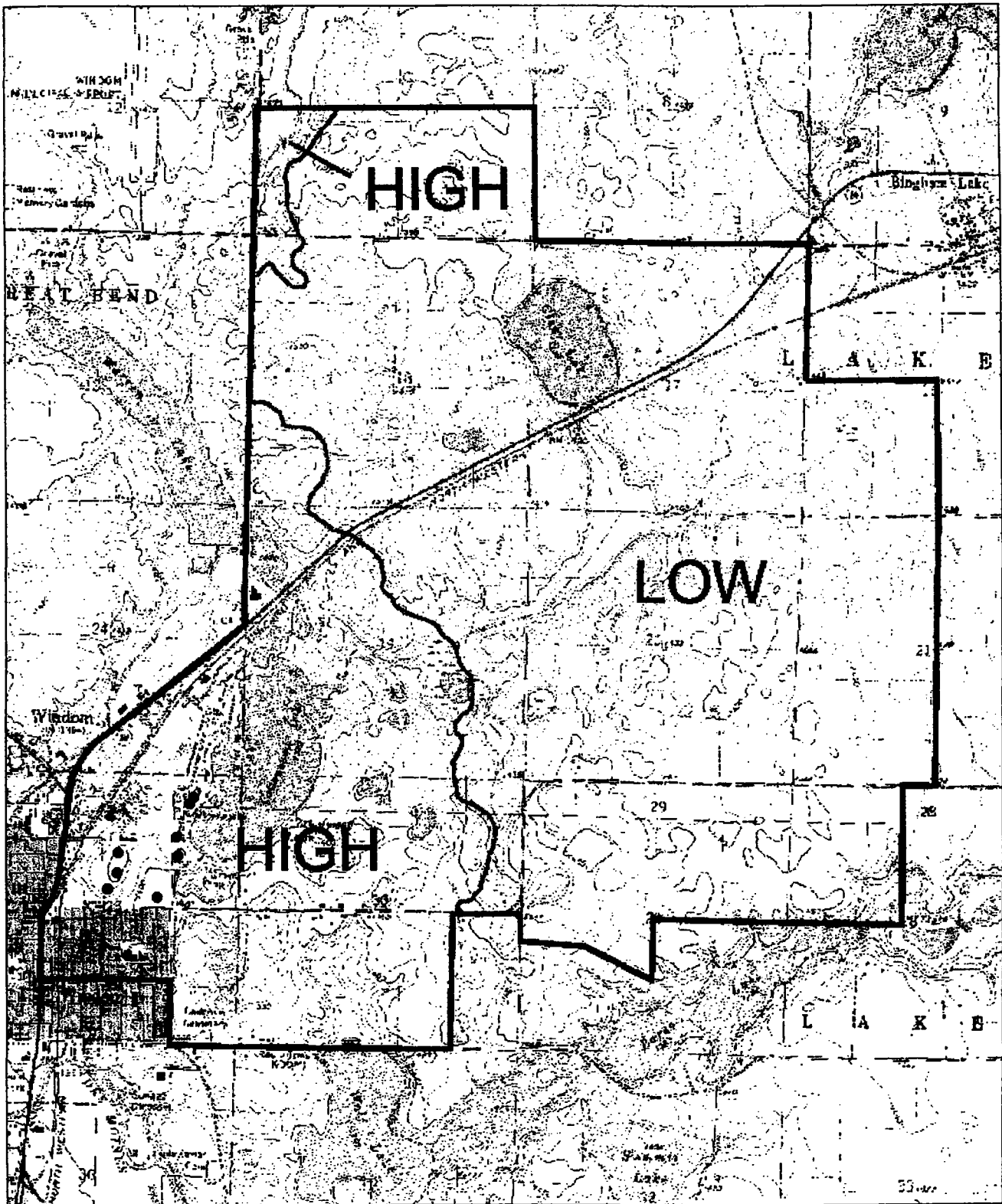


**Wenck**

Wenck Associates, Inc. 1800 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN 55359

February 2003

Figure 6



City of Windom

Vulnerability of the Drinking Water Supply Management Area

 **Wenck**

Wenck Associates, Inc. 1800 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN 55359

February 2003

Figure 7

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## **Appendix A**

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### **Well Logs**



Unique No. 00222638		MINNESOTA DEPARTMENT OF HEALTH <b>WELL AND BORING RECORD</b> <i>Minnesota Statutes Chapter 1031</i>			Update Date 2001/06/27	
County Name Cottonwood					Entry Date 1988/04/07	
Township Name Township Range Dir Section Subsection 105 36 W 25 AABDC			Well Depth 89 ft.		Depth Completed 85 ft. Date Well Completed /19/51	
Well Name WINDOM NO.3			Drilling Method			
Contact's Name WINDOM NO.3 WINDOM MN 56101			Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From ft. to ft.	
<b>GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO</b> GRAVEL 0 3 SANDY CLAY YELLO 3 38 SANDY CLAY BLUE 38 66 FINE SAND 66 74 COARSE SAND 74 89			Use Abandoned			
			Casing Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter	
			Casing Diameter Weight(lbs/ft) 8 in. to 0 ft			
			Screen Make			
			Static Water Level 28 ft. from Land surface Date /19/51			
			PUMPING LEVEL (below land surface) 38 ft. after hrs. pumping 300 g.p.m.			
			Well Head Completion Pitless adapter mfr Model Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)			
			Grouting Information Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No			
			Nearest Known Source of Contamination ft. direction type Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No			
			Pump <input type="checkbox"/> Not Installed Date Installed Mfr name Model HP 0 Volts Drop Pipe Length ft. Capacity g.p.m. Type			
REMARKS, ELEVATION, SOURCE OF DATA, etc.			Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No			
ABANDONED			Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No			
USGS Quad: Bingham Lake Elevation 1388 Aquifer: QBAA Alt Id: 75-4520			Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. DNR License Business Name Name of Driller			

**Report Copy**

Unique No. 00232448		<b>MINNESOTA DEPARTMENT OF HEALTH</b>		Update Date 2001/06/27	
County Name Cottonwood		<b>WELL AND BORING RECORD</b>		Entry Date 1988/04/07	
		<i>Minnesota Statutes Chapter 1031</i>			
Township Name Township Range Dir			Well Depth		Date Well Completed
105 36 W 25 AACAB			87 ft 87 ft		/19/54
Well Name WINDOM NO.4			Drilling Method		
Contact's Name WINDOM NO.4			Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No
WINDOM MN 56101					From ft. to ft.
			Use Community Supply (municipal)		
			Casing Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter
			Casing Diameter		Weight(lbs/ft)
			10 in. to 74 ft		
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO					
BLACK DIRT, GRAVEL BLACK 3 35					
FINE SAND 8 13					
COARSE SAND 13 87					
SANDY CLAY BLUE 24 8					
SANDY CLAY YELLOW 35 24					
			Screen Y		Open Hole From ft. to ft.
			Make		Type
			Diameter Slot Length Set		Fitting
			0 0 74 ft. to 87 ft		
			Static Water Level ft. from		Date
			PUMPING LEVEL (below land surface)		
			ft. after hrs. pumping		g.p.m.
			Well Head Completion		
			Pileless adapter mfr		Model
			Casing Protection		<input type="checkbox"/> 12 in. above grade
			<input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)		
			Grouting Information		Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No
			Nearest Known Source of Contamination		
			ft. direction		type
			Well disinfected upon completion?		<input type="checkbox"/> Yes <input type="checkbox"/> No
			Pump <input type="checkbox"/> Not installed		Date installed
			Mfr name		
			Model		HP 0 Volts
			Drop Pipe Length ft.		Capacity g.p.m.
			Type		
			Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No		
			Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No		
			Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. DNR		
			License Business Name		
			Name of Driller		

USGS Quad: Windom  
Aquifer: OBAA

Elevation 1384  
Alt. Id: 78-4520

**Report Copy**

Unique No. 00222652		<b>MINNESOTA DEPARTMENT OF HEALTH</b> <b>WELL AND BORING RECORD</b> <i>Minnesota Statutes Chapter 1031</i>			Update Date 2001/06/27																																																			
County Name Cottonwood					Entry Date 1988/04/07																																																			
Township Name    Township    Range    Dir    Section    Subsection 105            36        W            25            AACCCA			Well Depth            Depth Completed            Date Well Completed 124            ft.            124            ft.            /19/61																																																					
Well Name WINDOM NO.5			Drilling Method																																																					
Contact's Name            WINDOM NO.5  WINDOM MN 56101			Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From            ft. to            ft.																																																			
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">GEOLOGICAL MATERIAL</th> <th style="text-align: left;">COLOR</th> <th style="text-align: left;">HARDNESS</th> <th style="text-align: left;">FROM</th> <th style="text-align: left;">TO</th> </tr> </thead> <tbody> <tr><td>TOP SOIL</td><td></td><td></td><td>0</td><td>1</td></tr> <tr><td>MEDIUM COARSE SAND</td><td></td><td></td><td>1</td><td>20</td></tr> <tr><td>VERY FINE SAND</td><td></td><td></td><td>20</td><td>45</td></tr> <tr><td>FINE SAND</td><td>BLU-Y</td><td></td><td>45</td><td>60</td></tr> <tr><td>FINE SANDY GRAVEL</td><td></td><td></td><td>60</td><td>91</td></tr> <tr><td>COARSE SAND &amp; GRAVEL L</td><td></td><td></td><td>91</td><td>100</td></tr> <tr><td>FINE SAND</td><td></td><td></td><td>100</td><td>102</td></tr> <tr><td>MEDIUM COARSE SAND</td><td></td><td></td><td>102</td><td>108</td></tr> <tr><td>SAND &amp; SHALE</td><td></td><td></td><td>108</td><td>124</td></tr> </tbody> </table>			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	TOP SOIL			0	1	MEDIUM COARSE SAND			1	20	VERY FINE SAND			20	45	FINE SAND	BLU-Y		45	60	FINE SANDY GRAVEL			60	91	COARSE SAND & GRAVEL L			91	100	FINE SAND			100	102	MEDIUM COARSE SAND			102	108	SAND & SHALE			108	124	Use Community Supply (municipal)			
			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO																																																	
			TOP SOIL			0	1																																																	
			MEDIUM COARSE SAND			1	20																																																	
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			COARSE SAND & GRAVEL L			91	100																																																	
			FINE SAND			100	102																																																	
			MEDIUM COARSE SAND			102	108																																																	
SAND & SHALE			108	124																																																				
Casing            Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter																																																						
Casing Diameter            Weight(lbs/ft) 10 in. to            85 ft																																																								
Screen Y		Open Hole From            ft. to            ft.																																																						
Make            Type																																																								
Diameter Slot    Length    Set            Fitting																																																								
0            17            85            ft. to 102 ft																																																								
Static Water Level    44 ft. from Land surface            Date    /19/61																																																								
PUMPING LEVEL (below land surface) 85 ft. after            hrs. pumping    250 g.p.m.																																																								
Well Head Completion Pitless adapter mfr            Model Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)																																																								
Grouting Information            Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																								
Nearest Known Source of Contamination ft.            direction            type Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																								
Pump <input type="checkbox"/> Not Installed            Date Installed Mfr name Model            HP            0            Volts Drop Pipe Length            ft.            Capacity            g.p.m. Type																																																								
Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																								
Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																								
USGS Quad: Windom            Elevation 1390 Aquifer: QWTA            Alt Id: 784520		Well CONTRACTOR CERTIFICATION    Lic. Or Reg. No. <u>DNR</u> License Business Name Name of Driller																																																						

Report Copy





Unique No. 00489926		<b>MINNESOTA DEPARTMENT OF HEALTH</b>		Update Date 2001/06/27																																														
County Name Cottonwood		<b>WELL AND BORING RECORD</b>		Entry Date 1992/11/25																																														
		<i>Minnesota Statutes Chapter 1031</i>																																																
Township Name Township Range Dir Section Subsection 105 36 W 25 ACC			Well Depth 135 ft		Depth Completed 135 ft																																													
					Date Well Completed 1991/04/11																																													
Well Name WINDOM NO.8			Drilling Method Cable Tool																																															
Well Owner's Name WINDOM NO.8			Drilling Fluid Water		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No																																													
WINDOM MN 56101					From ft. to ft.																																													
Contact's Name CITY OF WINDOM 444 9TH ST WINDOM MN 56101-			Use Community Supply (municipal)																																															
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>GEOLOGICAL MATERIAL</th> <th>COLOR</th> <th>HARDNESS</th> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr> <td>SANDY CLAY</td> <td>TAN-B</td> <td>SOFT</td> <td>0</td> <td>3</td> </tr> <tr> <td>SAND-FINE W/SOME CLAY</td> <td>BRN-T</td> <td>SOFT</td> <td>3</td> <td>30</td> </tr> <tr> <td>SILT &amp; V. FINE SAND W/CLAY</td> <td>BROW</td> <td>SOFT</td> <td>30</td> <td>75</td> </tr> <tr> <td>SAND-VERY FINE &amp; SILT M</td> <td>LT. GR</td> <td>SOFT</td> <td>75</td> <td>100</td> </tr> <tr> <td>SAND-FINE W/SIGNS OF CL</td> <td>GRAY</td> <td>SOFT</td> <td>100</td> <td>112</td> </tr> <tr> <td>SAND-MEDIUM TO FINE</td> <td>GRAY</td> <td>SOFT</td> <td>112</td> <td>116</td> </tr> <tr> <td>SAND-MEDIUM TO FINE</td> <td>GRAY</td> <td>SOFT</td> <td>116</td> <td>118</td> </tr> <tr> <td>SAND-MEDIUM SOME SMALL</td> <td>GRAY</td> <td>SOFT</td> <td>118</td> <td>134</td> </tr> </tbody> </table>			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	SANDY CLAY	TAN-B	SOFT	0	3	SAND-FINE W/SOME CLAY	BRN-T	SOFT	3	30	SILT & V. FINE SAND W/CLAY	BROW	SOFT	30	75	SAND-VERY FINE & SILT M	LT. GR	SOFT	75	100	SAND-FINE W/SIGNS OF CL	GRAY	SOFT	100	112	SAND-MEDIUM TO FINE	GRAY	SOFT	112	116	SAND-MEDIUM TO FINE	GRAY	SOFT	116	118	SAND-MEDIUM SOME SMALL	GRAY	SOFT	118	134	Casing Drive Shoe? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Hole Diameter
			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO																																											
			SANDY CLAY	TAN-B	SOFT	0	3																																											
			SAND-FINE W/SOME CLAY	BRN-T	SOFT	3	30																																											
SILT & V. FINE SAND W/CLAY	BROW	SOFT	30	75																																														
SAND-VERY FINE & SILT M	LT. GR	SOFT	75	100																																														
SAND-FINE W/SIGNS OF CL	GRAY	SOFT	100	112																																														
SAND-MEDIUM TO FINE	GRAY	SOFT	112	116																																														
SAND-MEDIUM TO FINE	GRAY	SOFT	116	118																																														
SAND-MEDIUM SOME SMALL	GRAY	SOFT	118	134																																														
		Casing Diameter 24 in. to 13 ft		in. to 13 ft																																														
		20 in. to 119 ft		in. to 119 ft																																														
Screen Y			Open Hole From ft. to ft.																																															
Make JOHNSON			Type L																																															
Diameter Slot Length Set			Fitting																																															
20 19 115 ft. to 134 ft																																																		
Static Water Level 56 ft. from Land surface			Date 91/04/11																																															
PUMPING LEVEL (below land surface)																																																		
87.14 ft. after 24 hrs. pumping 888 g.p.m.																																																		
Well Head Completion																																																		
Pileless adapter mfr Model																																																		
Casing Protection <input checked="" type="checkbox"/> 12 in. above grade																																																		
<input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)																																																		
Grouting Information Well grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																																		
Material		From To (ft.)		Amount (yds/bags)																																														
G		2 13																																																
Nearest Known Source of Contamination																																																		
1320 ft. direction E type O																																																		
Well disinfected upon completion? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																																		
Pump <input checked="" type="checkbox"/> Not installed Date installed N																																																		
Mfr name																																																		
Model		HP		Volts																																														
Drop Pipe Length ft.		Capacity		g.p.m.																																														
Type																																																		
Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																																		
Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																		
Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 65252																																																		
License Business Name			Ervin Well Co.																																															
Name of Driller			ERVIN, D.																																															

USGS Quad:  
Aquifer:

Elevation 1402  
Alt. 78-4520

**Report Copy**

Unique No. 595769		<b>MINNESOTA DEPARTMENT OF HEALTH</b>		Update Date 2001/06/27																																				
County Name Cottonwood		<b>WELL AND BORING RECORD</b>		Entry Date 2000/04/06																																				
		<i>Minnesota Statutes Chapter 1031</i>																																						
Township Name Township Range Dir Section Subsection 105 36 W 24 DDD			Well Depth 113 ft.		Depth Completed 110 ft. Date Well Completed 1997/06/13																																			
Well Name WINDON TW <b>TW-9</b>			Drilling Method Non-specified Rotary																																					
Well Owner's Name WINDON TW 16TH ST WINDOM MN 56101- y			Drilling Fluid Bentonite		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From ft. to ft.																																			
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>GEOLOGICAL MATERIAL</th> <th>COLOR</th> <th>HARDNESS</th> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr> <td>SAND/GRAVEL</td> <td>BROW</td> <td>SOFT</td> <td>0</td> <td>60</td> </tr> <tr> <td>CLAY</td> <td>BROW</td> <td>SOFT</td> <td>60</td> <td>70</td> </tr> <tr> <td>SAND FINE</td> <td>GRAY</td> <td>SOFT</td> <td>70</td> <td>90</td> </tr> <tr> <td>SAND/COBBLES</td> <td>VARIE</td> <td>MEDIUM</td> <td>90</td> <td>99</td> </tr> <tr> <td>SAND/CLAY LENSE</td> <td>GRAY</td> <td>MEDIUM</td> <td>99</td> <td>105</td> </tr> <tr> <td>CLAY</td> <td>GRAY</td> <td></td> <td>105</td> <td>113</td> </tr> </tbody> </table>			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	SAND/GRAVEL	BROW	SOFT	0	60	CLAY	BROW	SOFT	60	70	SAND FINE	GRAY	SOFT	70	90	SAND/COBBLES	VARIE	MEDIUM	90	99	SAND/CLAY LENSE	GRAY	MEDIUM	99	105	CLAY	GRAY		105	113	Use Community Supply (municipal)		
			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO																																	
			SAND/GRAVEL	BROW	SOFT	0	60																																	
			CLAY	BROW	SOFT	60	70																																	
			SAND FINE	GRAY	SOFT	70	90																																	
			SAND/COBBLES	VARIE	MEDIUM	90	99																																	
			SAND/CLAY LENSE	GRAY	MEDIUM	99	105																																	
			CLAY	GRAY		105	113																																	
			Casing Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter in. to 113 ft.																																			
			Casing Diameter 10 in. to 90 ft.		Weight(lbs/ft)																																			
Screen Y		Open Hole From ft. to ft.																																						
Make JOHNSON		Type L																																						
Diameter Slot Length Set		Fitting																																						
10 40 20 90 ft. to 110 ft.																																								
Static Water Level 48 ft. from Land surface			Date 97/06/16																																					
PUMPING LEVEL (below land surface)			78 ft. after 12 hrs. pumping 50 g.p.m.																																					
Well Head Completion			Model																																					
Pitless adapter mfr			<input checked="" type="checkbox"/> 12 in. above grade																																					
Casing Protection			<input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)																																					
Grouting Information			Well grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																					
Material From To (ft.) Amount(yds/bags)			G 0 85 3 Y																																					
Nearest Known Source of Contamination			200 ft. direction N type SDF																																					
Well disinfected upon completion?			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																					
Pump <input checked="" type="checkbox"/> Not Installed			Date Installed N																																					
Mfr name			Model HP Volts																																					
Drop Pipe Length ft.			Capacity g.p.m.																																					
Type																																								
Any not in use and not sealed well(s) on property?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																					
Was a variance granted from the MDH for this Well?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																					
USGS Quad: Elevation 1402			Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27058																																					
Aquifer: Alt Id: 1170006S07			License Business Name Bergerson-caswell																																					
<b>Report Copy</b>			Name of Driller HOLMAN, G.																																					

Unique No. 683837		<b>MINNESOTA DEPARTMENT OF HEALTH</b>				Update Date 2001/05/30																																																																		
County Name Cottonwood		<b>WELL AND BORING RECORD</b>				Entry Date 2000/03/23																																																																		
<i>Minnesota Statutes Chapter 1031</i>																																																																								
Township Name Township Range Dir Section Subsection 105 36 W 25 ACC				Well Depth 128 ft		Depth Completed 125 ft																																																																		
						Date Well Completed 1998/03/12																																																																		
Well Name WINDOM 10				Drilling Method Non-specified Rotary																																																																				
Well Owner's Name WINDOM 10 13TH ST WINDOM MN 56101-				Drilling Fluid Bentonite		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																																		
						From ft. to ft.																																																																		
Contact's Name CITY OF WINDOM P.O. BOX 38 WINDOM MN 56101-				Use Community Supply (municipal)																																																																				
				Casing Drive Shoes? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter in. to 128 ft																																																																		
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>GEOLOGICAL MATERIAL</th> <th>COLOR</th> <th>HARDNESS</th> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr> <td>SAND SILTY, FINE</td> <td>BROW</td> <td></td> <td>2</td> <td>10</td> </tr> <tr> <td>SAND SOME GRAVEL MED</td> <td>BROW</td> <td></td> <td>10</td> <td>21</td> </tr> <tr> <td>TOP SOIL SILTY</td> <td>BROW</td> <td></td> <td>10</td> <td>2</td> </tr> <tr> <td>MED. SAND W/GRAVEL W/S</td> <td>BROW</td> <td></td> <td>21</td> <td>51</td> </tr> <tr> <td>DIRTY SAND FINE TO MED.</td> <td>GRAY</td> <td></td> <td>51</td> <td>66</td> </tr> <tr> <td>SAND SOME BEBBLES FINE</td> <td></td> <td></td> <td>66</td> <td>78</td> </tr> <tr> <td>SAND FINE W/SILTY CLAY &amp; TAN-G</td> <td></td> <td></td> <td>78</td> <td>93</td> </tr> <tr> <td>CLAY W/SOME FINE SAND</td> <td>GRAY</td> <td></td> <td>93</td> <td>103</td> </tr> <tr> <td>SAND, FINE</td> <td>TAN</td> <td></td> <td>103</td> <td>106</td> </tr> <tr> <td>SAND, FINE TO MED. CLEA</td> <td>GRY-T</td> <td></td> <td>106</td> <td>110</td> </tr> <tr> <td>SAND MED. TO COARSER</td> <td>GRAY</td> <td></td> <td>110</td> <td>124</td> </tr> <tr> <td>CLAY</td> <td>GRAY</td> <td></td> <td>124</td> <td>128</td> </tr> </tbody> </table>				GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	SAND SILTY, FINE	BROW		2	10	SAND SOME GRAVEL MED	BROW		10	21	TOP SOIL SILTY	BROW		10	2	MED. SAND W/GRAVEL W/S	BROW		21	51	DIRTY SAND FINE TO MED.	GRAY		51	66	SAND SOME BEBBLES FINE			66	78	SAND FINE W/SILTY CLAY & TAN-G			78	93	CLAY W/SOME FINE SAND	GRAY		93	103	SAND, FINE	TAN		103	106	SAND, FINE TO MED. CLEA	GRY-T		106	110	SAND MED. TO COARSER	GRAY		110	124	CLAY	GRAY		124	128	Casing Diameter 12 in. to 105 ft		Weight(lbs/ft) 49.56	
				GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO																																																																
SAND SILTY, FINE	BROW		2	10																																																																				
SAND SOME GRAVEL MED	BROW		10	21																																																																				
TOP SOIL SILTY	BROW		10	2																																																																				
MED. SAND W/GRAVEL W/S	BROW		21	51																																																																				
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				Screen Y		Open Hole From ft. to ft.																																																																		
				Make JOHNSON		Type L																																																																		
				Diameter Slot 12		Length Set 25																																																																		
						Fitting 20																																																																		
						105 ft. to 125 ft																																																																		
				Static Water Level 44 ft. from Top of casing above LS Date 98/03/12																																																																				
				PUMPING LEVEL (below land surface)																																																																				
				58.76 ft. after hrs. pumping 855 g.p.m.																																																																				
				Well Head Completion																																																																				
				Pitless adapter mfr		Model																																																																		
				Casing Protection		<input checked="" type="checkbox"/> 12 in. above grade																																																																		
				<input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)																																																																				
				Grouting Information		Well grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																																																		
				Material G		From To (ft.) 0 95																																																																		
						Amount(yds/bags) 2.5 Y																																																																		
				Nearest Known Source of Contamination																																																																				
				ft. direction		type																																																																		
				Well disinfected upon completion? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																																																				
				Pump <input checked="" type="checkbox"/> Not Installed		Date Installed N																																																																		
				Mfr name																																																																				
				Model		HP Volts																																																																		
				Drop Pipe Length ft.		Capacity g.p.m.																																																																		
				Type																																																																				
				Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																																																				
				Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																																																				
				Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 91686																																																																				
				Licensee Business Name L.L.D. Enterprises, Inc.																																																																				
				Name of Driller VERDECK, D.																																																																				

USGS Quad:                      Elevation 1389  
 Aquifer:                      Alt. 78-4520

## Report Copy



Unique No. 00136887		MINNESOTA DEPARTMENT OF HEALTH <b>WELL AND BORING RECORD</b>		Update Date 1992/08/07																																																								
County Name Cottonwood		Minnesota Statutes Chapter 1031		Entry Date 1988/04/07																																																								
Township Name Township Range Dir Section Subsection 105 36 W 22 ABABCA			Well Depth 330 ft.		Date Well Completed 1978/05/03																																																							
Well Name LEWIS, JOHN			Drilling Method Non-specified Rotary																																																									
Contact's Name LEWIS, JOHN  WINDOM MN 56101			Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From ft. to ft.																																																							
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>GEOLOGICAL MATERIAL</th> <th>COLOR</th> <th>HARDNESS</th> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr><td>TOP SOIL</td><td>BLACK</td><td></td><td>0</td><td>3</td></tr> <tr><td>SANDY CLAY</td><td>YELLOW</td><td></td><td>3</td><td>18</td></tr> <tr><td>CLAY</td><td>BLUE</td><td></td><td>18</td><td>36</td></tr> <tr><td>SAND</td><td>BROWN</td><td></td><td>36</td><td>37</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>37</td><td>88</td></tr> <tr><td>SAND</td><td>GRAY</td><td></td><td>88</td><td>89</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>89</td><td>157</td></tr> <tr><td>CLAY</td><td>BLACK</td><td></td><td>157</td><td>173</td></tr> <tr><td>CLAY</td><td>YELLOW</td><td></td><td>173</td><td>320</td></tr> <tr><td>SAND</td><td>GRAY</td><td></td><td>320</td><td>330</td></tr> </tbody> </table>			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	TOP SOIL	BLACK		0	3	SANDY CLAY	YELLOW		3	18	CLAY	BLUE		18	36	SAND	BROWN		36	37	CLAY	GRAY		37	88	SAND	GRAY		88	89	CLAY	GRAY		89	157	CLAY	BLACK		157	173	CLAY	YELLOW		173	320	SAND	GRAY		320	330	Use Domestic		
			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO																																																					
			TOP SOIL	BLACK		0	3																																																					
			SANDY CLAY	YELLOW		3	18																																																					
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SAND	GRAY		320	330																																																								
Casing Drive Shoe? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> N		Hole Diameter																																																										
Casing Diameter 5 in. to 326 ft. Weight(lbs/ft)																																																												
Screen Y		Open Hole From ft. to ft.																																																										
Make JOHNSON		Type L																																																										
Diameter Slot Length Set		Fitting																																																										
0 25 4 326 ft. to 330 ft.																																																												
Static Water Level 80 ft. from Land surface			Date 978/05/03																																																									
PUMPING LEVEL (below land surface)																																																												
180 ft. after hrs. pumping 50 g.p.m.																																																												
Well Head Completion																																																												
Pitless adapter mfr Model																																																												
Casing Protection <input type="checkbox"/> 12 in. above grade																																																												
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Nearest Known Source of Contamination																																																												
ft. direction type																																																												
Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																												
Pump <input checked="" type="checkbox"/> Not Installed Date Installed N																																																												
Mfr name																																																												
Model HP 0 Volts																																																												
Drop Pipe Length ft. Capacity g.p.m.																																																												
Type																																																												
Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																												
Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																												
Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 08317																																																												
License Business Name Fredrickson's																																																												
Name of Driller																																																												

USGS Quad: Harder Lake  
 Aquifer: QBAA

Elevation 1430  
 Alt Id:

## Report Copy

Unique No. 08222637		MINNESOTA DEPARTMENT OF HEALTH <b>WELL AND BORING RECORD</b> <i>Minnesota Statutes Chapter 1031</i>		Update Date 1992/08/07	
County Name Cottonwood				Entry Date 1988/04/07	
Township Name	Township	Range	Dir	Section	Subsection
	105	36	W	25	AABBC
Well Name WINDOM 67		Well Depth 120 ft		Depth Completed 120 ft	
				Date Well Completed 1969/01/21	
Contact's Name WINDOM 67		Drilling Method			
WINDOM MN 56101		Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No	
				From ft. to ft.	
		Use Municipal			
		Casing Drive Shoes? <input type="checkbox"/> Yes <input type="checkbox"/> N		Hole Diameter	
		Casing Diameter		Weight(lbs/ft)	
		16 in. to 58 ft			
		10 in. to 88 ft			
		Screen N		Open Hole From 88 ft. to 120 ft.	
		Make		Type	
		Static Water Level 33 ft. from Land surface		Date 969/01/21	
		PUMPING LEVEL (below land surface)			
		57 ft. after hrs. pumping 300 g.p.m.			
		Well Head Completion			
		Pileless adapter mfr		Model	
		Casing Protection		<input type="checkbox"/> 12 in. above grade	
		<input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)			
		Grouting Information		Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No	
		Nearest Known Source of Contamination			
		ft. direction		type	
		Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No			
		Pump <input type="checkbox"/> Not installed		Date installed	
		Mfr name			
		Model		HP	0 Volts
		Drop Pipe Length ft.		Capacity	g.p.m.
		Type			
		Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No			
		Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No			
USGS Quad: Bingham Lake		Elevation 1389		Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. USGS	
Aquifer: OBAA		Alt. Id: 78-4520		License Business Name United States Geological Survey	
		Name of Driller			

**Report Copy**

Unique No. 00133186		MINNESOTA DEPARTMENT OF HEALTH <b>WELL AND BORING RECORD</b> <i>Minnesota Statutes Chapter 1031</i>		Update Date 1992/08/07																																																																		
County Name Cottonwood				Entry Date 1988/04/07																																																																		
Township Name Township Range Dir Section Subsection 105 36 W 24 ADDBDA			Well Depth 290 ft.		Depth Completed 290 ft. Date Well Completed 1977/06/24																																																																	
Well Name WINDOM SALES CO.			Drilling Method Non-specified Rotary																																																																			
Contact's Name WINDOM SALES CO.  WINDOM MN 56101			Drilling Fluid		Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From ft. to ft.																																																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>GEOLOGICAL MATERIAL</th> <th>COLOR</th> <th>HARDNESS</th> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr><td>TOPSOIL</td><td>BLACK</td><td></td><td>0</td><td>3</td></tr> <tr><td>SAND</td><td>BROW</td><td></td><td>3</td><td>9</td></tr> <tr><td>CLAY</td><td>BLUE</td><td></td><td>9</td><td>19</td></tr> <tr><td>SANDY CLAY</td><td>GRAY</td><td></td><td>19</td><td>50</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>50</td><td>111</td></tr> <tr><td>SAND</td><td>GRAY</td><td></td><td>111</td><td>112</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>112</td><td>156</td></tr> <tr><td>SANDY CLAY</td><td>GRAY</td><td></td><td>156</td><td>159</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>159</td><td>163</td></tr> <tr><td>CLAY</td><td>BROW</td><td></td><td>163</td><td>198</td></tr> <tr><td>CLAY</td><td>GRAY</td><td></td><td>198</td><td>275</td></tr> <tr><td>SAND</td><td>GRAY</td><td></td><td>275</td><td>290</td></tr> </tbody> </table>			GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	TOPSOIL	BLACK		0	3	SAND	BROW		3	9	CLAY	BLUE		9	19	SANDY CLAY	GRAY		19	50	CLAY	GRAY		50	111	SAND	GRAY		111	112	CLAY	GRAY		112	156	SANDY CLAY	GRAY		156	159	CLAY	GRAY		159	163	CLAY	BROW		163	198	CLAY	GRAY		198	275	SAND	GRAY		275	290	Use Domestic		
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CLAY	BROW		163	198																																																																		
CLAY	GRAY		198	275																																																																		
SAND	GRAY		275	290																																																																		
Casing Drive Shoe? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> N		Hole Diameter 0 in. to 290 ft																																																																				
Casing Diameter 5 in. to 286 ft		Weight(lbs/ft)																																																																				
Screen Y		Open Hole From ft. to ft.																																																																				
Make JOHNSON 304		Type L																																																																				
Diameter Slot Length Set		Fitting																																																																				
0 18 4 286 ft. to 290 ft																																																																						
Static Water Level 120 ft. from Land surface		Date 977/06/24																																																																				
PUMPING LEVEL (below land surface) 150 ft. after hrs. pumping 15 g.p.m.																																																																						
Well Head Completion Pitless adapter mfr Model Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)																																																																						
Grouting Information Well grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Material From To (ft.) Amount(yds/bags) B 0 0 0																																																																						
Nearest Known Source of Contamination 150 ft. direction W type BYD Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																																						
Pump <input checked="" type="checkbox"/> Not Installed Date Installed N Mfr name Model HP 0 Volts Drop Pipe Length ft. Capacity g.p.m. Type																																																																						
Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																																						
Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No																																																																						
USGS Quad: Bingham Lake Elevation 1398 Aquifer: QBAA Alt Id:		Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 08317 License Business Name Fredrickson's Name of Driller																																																																				

**Report Copy**

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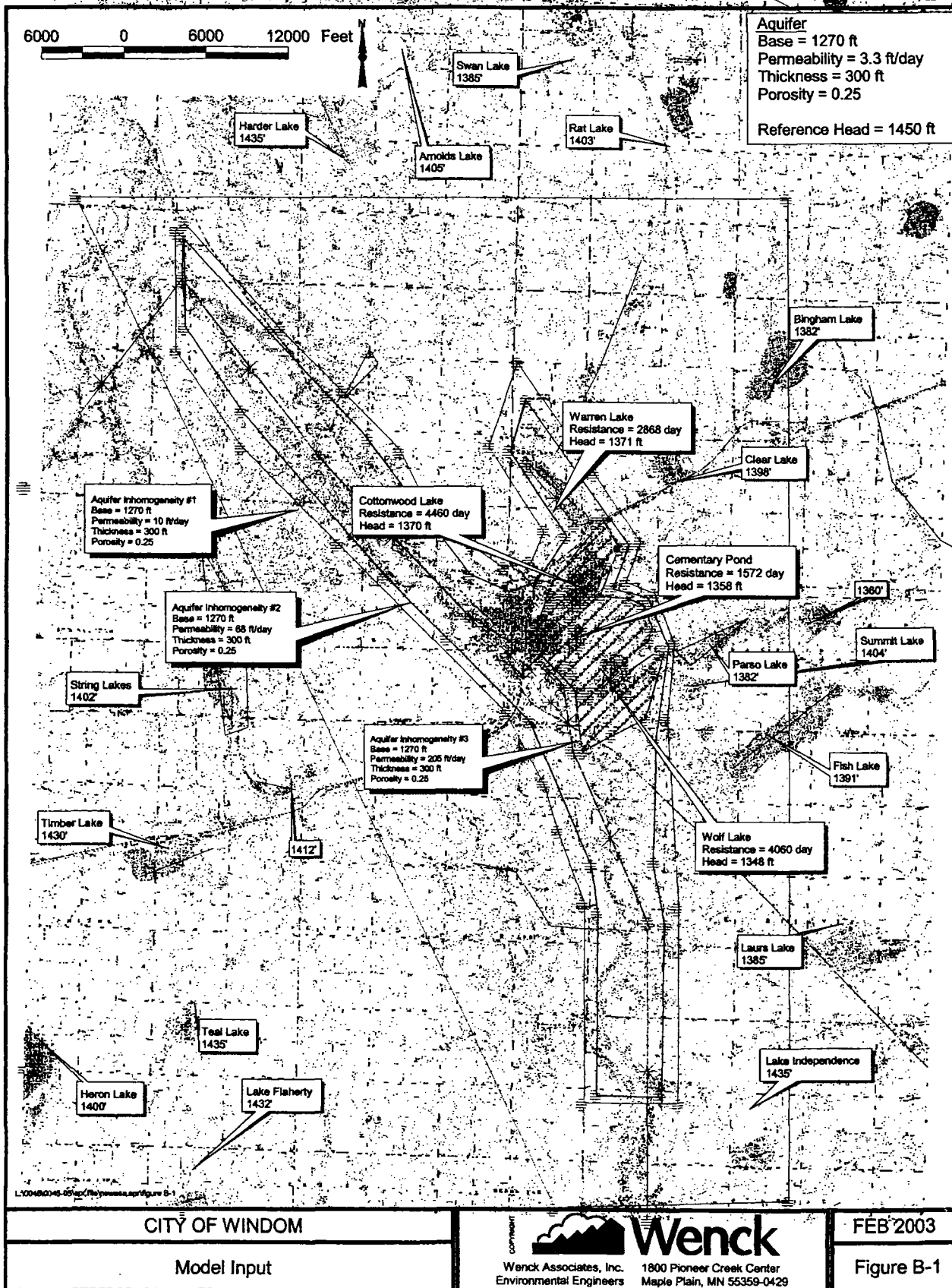
## **Appendix B**

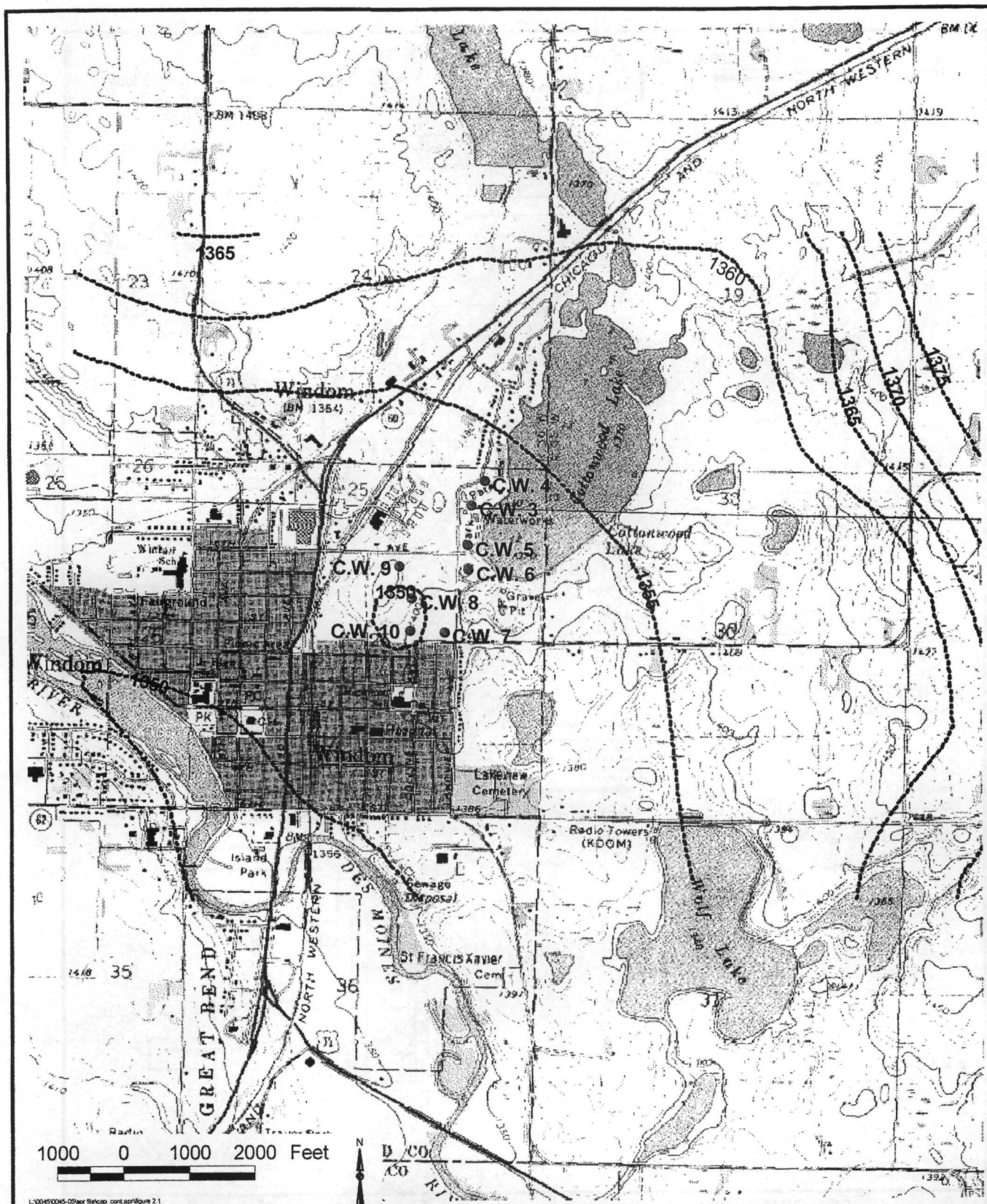
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**Model Input and Output Files  
(Prints and Electronic Files)**

**See Shp Files for Figures B-1 and B-2**

**See Model Input Output.zip File**





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## **Appendix C**

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### **MDH Well Vulnerability Assessment Printouts**

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #3A

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00232447

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: AACB

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. BURIED ARTES. AQUIFER	
DNR Geologic Sensitivity Rating: VL L	Score: 6	15
Geologic Data From	Well Record	
Year Constructed	1972	
Construction Method	Unknown	5
Casing Depth	78	10
Well Depth	92	
Casing grouted into borehole?	Unknown	5
Cement grout between casings?	Not Applicable	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	250	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	No	0
Maximum nitrate detected	Unknown	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0
Wellhead Protection Score		40
Wellhead Protection Vulnerability Rating:		NOT VULNERABLE

COMMENTS



PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #5

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00222652

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: AACC

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. WATER TABLE AQUIFER	
DNR Geologic Sensitivity Rating: H L	Score: 0	vulnerable
Geologic Data From	Well Record	
Year Constructed	1961	
Construction Method	Unknown	5
Casing Depth	85	10
Well Depth	124	
Casing grouted into borehole?	Unknown	5
Cement grout between casings?	Not Applicable	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	250	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	2.0 10/01/1975	10
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0

Wellhead Protection Score : 35  
Wellhead Protection Vulnerability Rating: VULNERABLE

COMMENTS

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #6

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00222651

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: ACDD

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. BURIED ARTES. AQUIFER	
DNR Geologic Sensitivity Rating: L L	Score: 2	20
Geologic Data From	Well Record	
Year Constructed	1969	
Construction Method	Cable Tool/Bored	0
Casing Depth	103	10
Well Depth	121	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	250	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	No	0
Maximum nitrate detected	<1.0 07/01/1970	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0
Wellhead Protection Score		40
Wellhead Protection Vulnerability Rating:		NOT VULNERABLE

COMMENTS

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #7

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00132251

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: ACDD

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. WATER TABLE AQUIFER	
DNR Geologic Sensitivity Rating: H L	Score: 0	vulnerable
Geologic Data From	Well Record	
Year Constructed	1977	
Construction Method	Cable Tool/Bored	0
Casing Depth	124	10
Well Depth	142	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	500	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	<0.4 12/01/1979	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0

Wellhead Protection Score : 15  
Wellhead Protection Vulnerability Rating: VULNERABLE

COMMENTS

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #8

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00490926

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: ACC

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. WATER TABLE AQUIFER	
DNR Geologic Sensitivity Rating: H L	Score: 0	vulnerable
Geologic Data From	Well Record	
Year Constructed	1991	
Construction Method	Rotary/Drilled	0
Casing Depth	119	10
Well Depth	134	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	888	10
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	Unknown	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0

Wellhead Protection Score : 25  
Wellhead Protection Vulnerability Rating: VULNERABLE

COMMENTS

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #9

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00595769

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 24 QUARTERS: DDD

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. BURIED ARTES. AQUIFER	
DNR Geologic Sensitivity Rating: L	Score: 1	20
Geologic Data From	Well Record	
Year Constructed	1997	
Construction Method	Rotary/Drilled	0
Casing Depth	90	10
Well Depth	110	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Not Applicable	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	50	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	Unknown	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0

Wellhead Protection Score : 35  
Wellhead Protection Vulnerability Rating: NOT VULNERABLE

COMMENTS

PMSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #10

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00603837

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: ACC

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. BURIED ARTES. AQUIFER	
DNR Geologic Sensitivity Rating: M L	Score: 0	25
Geologic Data From	Well Record	
Year Constructed	1998	
Construction Method	Rotary/Drilled	0
Casing Depth	105	10
Well Depth	125	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Not Applicable	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	455	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	Unknown	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0
Wellhead Protection Score		40
Wellhead Protection Vulnerability Rating:		NOT VULNERABLE

COMMENTS

PWSID : 1170006  
SYSTEM NAME: Windom  
WELL NAME : Well #4

TIER : 2  
WHP RANK : 0  
UNIQUE WELL #: 00232448

COUNTY: Cottonwood TOWNSHIP NUMBER: 105 RANGE: 36 SECTION: 25 QUARTERS: AAC

CRITERIA	DESCRIPTION	POINTS
Aquifer Name	QUAT. BURIED ARTES. AQUIFER	
DNR Geologic Sensitivity Rating: VL L	Score: 5	15
Geologic Data From	Public Water File	
Year Constructed	1954	
Construction Method	Unknown	5
Casing Depth	74	10
Well Depth	87	
Casing grouted into borehole?	Unknown	5
Cement grout between casings?	Not Applicable	0
All casings extend to land surface?	Yes	0
Gravel-packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?	Unknown	0
Pumping Rate:	250	5
Non-THMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected	<1.0 10/01/1975	0
Maximum tritium detected	Unknown	0
Carbon-14 age	Unknown	0

Wellhead Protection Score : 40  
Wellhead Protection Vulnerability Rating: NOT VULNERABLE

COMMENTS

**CITY OF WINDOM PUBLIC WATER  
SUPPLY SYSTEM**

**WINDOM MUNICIPAL WELLFIELD**

**WINDOM, MINNESOTA**

**WELLHEAD PROTECTION PLAN**

**Part 2**

- **Potential Contaminant Source Inventory**
- **Potential Contaminant Source Management Strategies**
- **Evaluation Plan**



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<b>                             Exhibit D</b>	

## **PUBLIC WATER SUPPLY PROFILE**

### **PUBLIC WATER SUPPLY**

NAME: City of Windom – PWSID 1170006  
ADDRESS: 444 9<sup>th</sup> Street, P.O. Box 38, Windom, MN 56101  
TELEPHONE NUMBER: (507) 831-6129  
E-MAIL: dwnelson@windom-mn.com FAX #: (507) 831-6127

### **WELLHEAD PROTECTION MANAGER**

NAME: Dennis Nelson & Mike Haugen  
ADDRESS: 444 9<sup>th</sup> Street, P.O. Box 38, Windom, MN 56101  
TELEPHONE NUMBER: (507) 831-6129  
E-MAIL: dwnelson@windom-mn.com FAX #: (507) 831-6127

### **CONSULTANT**

NAME: Wenck Associates, Inc.  
ADDRESS: 1800 Pioneer Creek Center, PO Box 249, Maple Plain, MN 55359  
TELEPHONE NUMBER: (763) 479-4200  
E-MAIL: FAX #: (763) 479-4242

### **GENERAL INFORMATION**

UNIQUE WELL NUMBER(S) 232447, 232448, 222652, 222651, 132251, 490926, 595769, 603837  
COUNTY: Cottonwood SIZE OF POPULATION SERVED: 4,490

## **DOCUMENTATION LIST**

<b>STEP</b>	<b>DATE PERFORMED</b>
<b>Scoping Meeting 2 Held: (4720.5349, subp. 1)</b>	<u><b>July 14, 2003</b></u>
<b>Scoping 2 Decision Notice Received: (4720.5340, subp. 2)</b>	<u><b>August 13, 2003</b></u>
<b>Remaining Portion of Plan Submitted to Local Units of Government (LGU's): (4720.5350, subp. 1 &amp; 2)</b>	<u><b>May 21, 2004</b></u>
<b>Review Received From Local Units of Government:(4720.5350, subp. 2)</b>	_____
<b>Public Hearing Conducted: (4720.5350, subp.4):</b>	_____
<b>Review/Comments Considered: (4720.5350, subp. 3)</b>	_____
<b>Remaining Portion WHP Plan Submitted: (4720.5360, subp. 1)</b>	_____
<b>Approved Review Notice Received:</b>	_____
<b>Implementation Notice Mailed to LGU's:</b>	_____
<b>WHP Plan Implementation Date:</b>	_____

## **City of Windom Public Water Supply System - Windom Municipal Well Field**

This portion of the Wellhead Protection (WHP) Plan for the City of Windom includes:

- The results of an inventory of potential contamination sources that may impact the City of Windom's Public Water Supply,
- Strategies to address potential contaminant sources identified,
- An evaluation plan to assess implementation effectiveness of the WHP Plan.

PART 1 of the Wellhead Protection (WHP) Plan contains 1) the description of how the wellhead protection area was delineated, 2) the boundaries of the drinking water supply management area (DWSMA), 3) the assessment of well vulnerability, and 4) the assessment of aquifer vulnerability throughout the DWSMA. The first part of this plan was approved by the Minnesota Department of Health on June 27, 2003. The WHPA/DWSMA boundary for the public water supply wells is shown on Figure 1.

The vulnerability assessment of the (DWSMA) for the City of Windom Public Water Supply System was determined by evaluating available information on geologic materials overlying the aquifers and the groundwater flow model.

Delineation of the wellhead protection area includes two components 1) the portion of the outwash channel aquifer included in the capture zones for the city wells, and 2) the surface water runoff area that provides recharge to the outwash channel aquifer. The vulnerability of these two areas differs because the channel aquifer is not present in most of the surface water runoff area. Here, clay-rich glacial deposits are present and surface water does not readily move vertically to recharge groundwater resources. Therefore, the composition of the glacial deposits within the DWSMA was evaluated to determine where clay-rich versus highly permeable sediments occurred below the soil horizon.

The MDNR sensitivity ratings were applied to the soils present within the DWSMA to prepare the vulnerability assessment for 1) the well capture zone area, 2) the areas where the outwash channel aquifer is present beyond the capture zones, and 3) the surface water runoff area.

The vulnerability of the area where the outwash channel aquifer is present is designated high because there appears to be no laterally persistent layers of fine-grained geologic materials to retard or prevent the vertical movement of water-borne contaminants. Elsewhere, the vulnerability of the DWSMA is designated as low because clay-rich glacial deposits are the predominant sediment type. Sand and gravel bodies may occur within these deposits, but are likely to be very localized and not in direct contact with the outwash channel aquifer.

A second scoping meeting held between the City of Windom Public Water Supply System (WPWSS) and the Minnesota Department of Health on July 14, 2003, identified that the remainder of the wellhead protection plan for the City of Windom Well Field needs to focus on addressing most land use activities in the DWSMA that may impact the public water supply wells.

**Primary management area:** The highly vulnerable area within the DWSMA which includes the area directly surrounding wells, will receive the most intense management attention, with emphasis on maintaining water quality drinking water supply and protection from possible contamination from various types of chemicals, nutrients, biological sources and petroleum products.

**Secondary management area:** The remaining area within the DWSMA will be managed primarily to control runoff and land surface impacts to water quality which supplies water to the aquifer.

PART 2 of the Wellhead Protection Plan for the WPWSS – City of Windom Municipal Well Field presents:

- 1) The results of the inventory of potential contamination sources that was conducted throughout the DWSMA.
- 2) A plan for managing potential contaminant sources so they do not present a health risk to the people served by the WPWSS – Windom Municipal Well Field Public Water Supply System.
- 3) An evaluation plan to assess implementation effectiveness of the WHP Plan.

Management concepts proposed will include:

1. Efforts to manage potential contaminant sources.
2. Public education to promote understanding and support of the wellhead protection plan.

The information and data contained in Chapters 1-4 of this WHP Plan provide support, and a basis, for the approaches taken in addressing the potential contaminate sources identified within the DWSMA. The reader is encouraged to concentrate attention on Chapters 1-4 in order to better understand why a particular management strategy is needed, or included, or not included, in Chapter 5.

It is the hope of the Wellhead Protection Committee, that members of the public will become more knowledgeable by understanding the information contained herein, and, further, they will be moved to take action in their individual daily lives to minimize potential problems with the quality of water currently enjoyed by customers of the City of Windom Public Water Supply System.

A key element in the successful implementation of this plan is working with local resource staff in Cottonwood County. This is especially important since most of the DWSMA is located outside of the corporate limits of the City of Windom. Furthermore, land use programs, services and planning is implemented through various resource agencies in Cottonwood County. The Cottonwood County Environmental Services, Soil and Water Conservation District, and Red Rock Rural Water are primary partners and supports in the implementation of this WHP Plan.

# **CHAPTER ONE**

## **DATA ELEMENTS and ASSESSMENT (4720.5200)**

### **I. Required Data Elements**

#### **A. Physical Environment Data Elements**

##### **1.) Precipitation:**

The Windom Well field area receives on average about 29 inches of precipitation annually. See [www.climate.umn.edu](http://www.climate.umn.edu) for a listing of average monthly and annual precipitation amounts measured in the vicinity of the WPWSS – Windom Well Field. According to information contained in Part I of this WHP Plan, there appears to be a connection between surface and groundwater in the Windom Well Field area. The potential for impact to water quality from storm water runoff is also of concern. The relationship between surface or near surface sources of contamination, precipitation and subsequent infiltration of surface water is a primary consideration in the development of this plan.

##### **2.) Geology:**

This data element has been addressed in Part I of the Plan. The DWSMA map (see Figure 1 and Exhibit C in appendix) illustrates the vulnerability of the well water capture areas and associated upland areas. A description of the geological conditions is on file with the MDH. Current geologic information indicates there is a lack of geologic protection of the aquifer from potential infiltration of contaminants from the surface therefore, the aquifer is considered to be highly vulnerable. This corresponds with the high vulnerability (groundwater recharge directly to the aquifer near the wells) and low vulnerability (upland surface water run-off area) categories noted within the DWSMA map shown in Figure 1.

##### **3.) Soil:**

Soils and their characteristics are considered in the development of this plan since there is a direct connection between the land surface, land use activities and the aquifer. Because there is not a protective layer of impervious soil or rock material between the earth's surface and the top of the aquifer in the "High Vulnerability" area, local soil conditions and soil infiltration characteristics may impact local water quality. Generally and as described in Part I of the WHP plan, soils with greater clay content are found in the "Low Vulnerability" area as shown in Figure 1. A copy of the Cottonwood County Soil Survey can be examined at the Cottonwood County Environmental office in Windom, Minnesota. (For soil survey information in DWSMA see Figure 2)

- 4.) **Water Resources:**  
Quality and quantity of surface water recharge directly impact the public water supply wells used by the City of Windom. Part 1 of the City's WHP Plan states, lakes located within the DWSMA appear to be directly connected to the aquifer (see Figure 1 and Exhibit C in Appendix). This link was determined during preliminary findings of a recent study by the United States Geological Service (USGS). The study's final report has at this time not been completed. Anticipated completion date for the study is July 2004. At that time a copy will be available for review at Windom City Hall. A small portion of the primary management area is subject to flooding (see Figure #3).

**B. Land Use Data Elements**

- 1.) **Land Use:**  
A list of land parcels within the WPWSS/DWSMA, and the property identification number for each parcel as assigned by the County, is on file in the WPWSS offices. Land use in the DWSMA is primarily agricultural, with a small amount of rural residential. Land use controls within the DWSMA are administered and reside with the Cottonwood County Environmental Office and the City of Windom Planning and Zoning Department. The "High Vulnerability" areas within the city limits include business, industrial and residential land use. The City of Windom is currently updating their Comprehensive Land Use Plan. The plan should be completed in December 2005. The DWSMA map will be incorporated into the Windom Comprehensive Land Use Plan. The Cottonwood County Comprehensive Land Use Plan was last updated in 1991. The County is in the process of updating the plan, however progress is slow due to lack of funding and staff time. No significant changes from existing land uses presently found in the DWSMA are anticipated in the foreseeable future. A land use map and City zoning map is included as Figure 4 & 5. Because of the high vulnerability of the aquifer, the groundwater is susceptible to contamination from many land uses typical for the area.

The Windom WHP Team discussed potential contaminants within the DWSMA that may impact groundwater and water produced by the City wells. Contaminant source information considered was based on local WHP Team knowledge, information provided by MDH, Cottonwood County Environmental Services, SWCD and Red Rock Rural Water.

The DWSMA has a total acre area of approximately 5,000 acres (see land use graph Figure 6). 896 of those acres are in conservation programs, another 800 acres are in hay/pasture/grassland, and another 100 acres are in brushland/forested. This consists of 34% of the total acres that provide an important buffer between farm fields and help filter run-off from entering the

aquifer used by City wells. Continued protection of these areas is important in the long-term protection of groundwater and drinking water quality.

Two feedlots were identified within the secondary DWSMA management area, along with approximately 640 acres that are used for manure management practices. The team identified 89 wells, 7 wells are within the low vulnerability area, 82 wells are in the high vulnerability zone. There are 22 septic systems within the DWSMA. 19 of these systems are in compliance, 4 of these compliant systems are in the low vulnerability zone, and the other 15 are in the high vulnerability zone. There are 3 septic systems that are not in compliance. These three non-complaint systems are located in the low vulnerability zone.

Also considered is a former landfill site that is located within the high vulnerability area. This superfund site has been on a regular monitoring schedule. The site is monitored by obtaining water samples through monitoring wells. MPCA has notified the city that regular water testing samples indicate that the site has been cleaned up and it has been delisted. However, regular testing of the site will be required.

The remaining potential contaminant sources identified with information provided by the WHP Team are listed in Exhibit A and discussed further in paragraph 3 below.

2.) Public Utility Services:

Existing ground transportation corridors within the DWSMA may be seen on the attached map (see Figure 8). Because the aquifer is vulnerable, management of spills and accidental discharges are addressed in the DNR Emergency/Contingency Plan.

The WHP Team identified a natural gas pipeline on the northern edge of the WHP area. The pipeline is located in the secondary management area (Low Priority Area). There are public drainage systems identified within the DWSMA. The drainage systems are located primarily in the secondary management area and are primarily used for agricultural purposes. (See Figure 9) A map of city utilities may be reviewed at Windom City Hall.

3.) Potential Contaminant Source Inventory:

With the assistance of MDH and LGU Staff, the WPWSS Wellhead Protection Committee conducted an inventory of known potential contaminant sources (PCS) located within the DWSMA (see Exhibit A). Several categories of PCS are currently found within the DWSMA and are summarized as follows: including: 89 wells, 22 on-site sewage treatment systems, 3 agricultural production areas, 6 storage tanks, 1 salvage yard, 1 site that requires a Resource Management Plan, 2 gravel pits, a superfund site that was former dump, a natural gas pipeline, a cemetery, 2 feedlots and



manure management practices and transportation corridors. WPWSS intends to continue monitoring known PCS locations within the DWSMA and will attempt, with the cooperation of MDH, to identify new PCS uses in the future.

Management of the DWSMA will involve strategies to address all categories of identified PCSI. See Chapter 4 and 5 for more detail.

#### **C. Water Quantity Data Elements**

- 1.) **Surface Water Quantity:**  
Minnesota DNR staff periodically collects water level data from Cottonwood Lake.
- 2.) **Groundwater Quantity:**  
Data collected indicates there are several known wells covered by state groundwater appropriation permits and state environmental boreholes located within the DWSMA. Data collected further indicates at low flow in the Des Moines River there is a correlation of water quality of aquifer and surface water. Groundwater levels and quantity are adequate for the amounts that the City of Windom currently is permitted for groundwater appropriation that is administered by the DNR. Presently, there appears to be sufficient groundwater quantity based upon existing pumping capacity of all wells completed in the aquifer used by the City. The City of Windom will continue to work with the MDH and DNR to identify any new high capacity wells in the area that may affect the WPWSS or alter current WHPA delineations.

#### **D. Water Quality Data Elements**

- 1.) **Surface Water Quality:**  
Overall, the quality of surface water directly impacts the quality of the groundwater produced by the City of Windom public water supply wells. All activities identified in this plan aim to protect or improve surface water which ultimately effects groundwater quality. WPWSS field staff are encouraged to monitor surface water quality on a regular basis. To review recent surface water quality data contact the Cottonwood County Environmental office in Windom.
- 2.) **Groundwater Quality:**  
Well water quality from the City of Windom wells is of good quality. Presently, no contaminant levels have been reported that exceed maximum contaminant levels set by the Federal Safe Drinking Water Standards. The following chart is a reproduction of a typical water quality sampling report from the WPWSS Well Field water supply wells in 2002:

pH	7.6 units
Alkalinity – total	264 mg/L
Sulfate	76.5 mg/L
Chloride	32.9 mg/L
Nitrate+Nitrite	1.18 mg/L as N
Total Dissolved Solids	433 mg/L
Calcium	490.4 mg/L
Sodium	13.4 mg/L
Iron	.132 mg/L
Magnesium	32 mg/L
Hardness Calcium	358 mg/L

See Appendix, Exhibit B for copy of the WPWSS 2003 CONSUMER CONFIDENCE REPORT.

## **II. Assessment of Data Elements**

### **A. Use of the Wells:**

WPWSS obtains its water supply from seven wells (City Wells 3, 4, 5, 6, 8, 9 and 10) as shown in Figure 1. The City has one additional well (City Well 7) designated for backup use only. The City is currently permitted with the MDNR to pump 420,000,000 gallons per year. The entire water system provides drinking water to 2,056 metered service connections in the City of Windom and Bingham Lake through appurtenant distribution mains, lines and services. In 2002 the system also provided 60,000,000 gallons of water to Red Rock Rural Water and 128,723,000 gallons to Ethanol 2000. Historic water usage over the past ten (10) years averages approximately 700,129 gallons per day. However, usage has increased over the past 10 years from 555,896 gallons per day in 1993 to 1,125,543 gallon per day in 2002. Significant future demands or reductions on WPWSS water supply could affect the WHPA or DWSMA areas and/or the management strategies.

### **B. Wellhead Protection Area Delineation Criteria**

The WPHA was delineated using the MLAEM model based on the 10-year capture zone of City wells and surface water component contributing to that area. WPWSS is proposing to continue collection of groundwater flow information, when available, in order to more accurately define the WHPA in future revisions to this WHP Plan and to increase local knowledge of the groundwater conditions.

The following data was utilized in determining the boundaries of the WHPA. Detailed information regarding the delineation of the WHPA and DWSMA is contained in Part 1. (See Exhibit C Appendix)

- 1.) Time of Travel:  
10 years

- 2.) Flow Boundaries:  
Aquifer thickness 100'  
Aquifer porosity .025
- 3.) Modeled Annual Volume of water pumped:  
458,667,600 gallons
- 4.) Ground Water Flow Field:  
The average ground water hydraulic gradient ranges from 0.0015 to 0.003 ft/ft.
- 5.) Aquifer Transmissivity:  
14,350 ft<sup>2</sup>/day

**C. Quality and Quantity of Water Supplying the Public Water Supply Well.**

The water from the WPWSS is regarded as good in quality and is regularly sampled and analyzed for contaminants identified under the Federal Safe Drinking Water Act. This water meets or exceeds federal water quality standards. Presently, no problems have been identified in regards to the quantity or quality of water pumped.

**D. The Land and Groundwater Uses in the Drinking Water Supply Management Area.**

The land within the DWSMA is primarily used for typical rural purposes including, agricultural cropping, feedlots, rural residential, and open lands uses. There is also a small urban area that is located within the city limits. These types of land uses have not changed significantly over time. Several private wells extend into the unprotected aquifer. The water drawn from these wells is used primarily for drinking water. Because of the high vulnerability of the aquifer, land uses and associated groundwater uses within the DWSMA have a direct affect on development of management strategies that address potential contaminant sources.

A set of maps indicating current land uses is on file at the Cottonwood County Environmental Office and the City of Windom Planning and Zoning Office in Windom (see Figures 4, 5, 6 & 7). A careful review of these documents is very useful in identifying potential contaminant sources. Management strategies will be addressed in Chapter Five.

The intent of the City of Windom and WHP Team is to heighten awareness regarding the connection of land use activities and impacts on groundwater quality. Poor land use decisions and management activities can and will have an impact on the quality of water used by the City of Windom for drinking water .

## **CHAPTER TWO**

### **IMPACT OF CHANGES ON PUBLIC WATER SUPPLY WELL (4720.5220)**

#### **I. Changes Identified In:**

- A.) ***Physical Environment:*** No major changes in the physical environment within the DWSMA of the Windom well field are expected within the next ten years.
- B.) ***Land Use:*** The land use within the DWSMA is primarily agricultural in nature. Except for a small portion that is urban and located within the Windom City limits. 2003-2004 Comprehensive Plan indicates activities to the north are outside the DWSMA and no growth is anticipated in the DWSMA. No major changes in agricultural land use classification within the DWSMA of the Windom well field is expected within the next ten years. However, changes in agricultural land management practices are likely as a result of various educational and incentive programs to encourage increased adoption of crop and soil best management practices. The property around Cottonwood Lake is in a permanent conservation easement.
- C.) ***Surface Water:*** No major changes in surface water sources in and around the DWSMA of the Windom well field is expected within the next ten years.
- D.) ***Groundwater:*** The city wells have historically provided excellent quality and quantity of ground water. No major changes in groundwater within the DWSMA of the Windom well fields is expected within the next 10 years.

#### **II. Impact of Changes:**

- A.) ***Expected Changes in Water Use:*** No major changes are anticipated over the next 10 years which may impact the historic appropriation of water pumped at the Windom well field. The approved delineation of the WHPA attempted to take into consideration any expected changes in water use by WPWSS to supply typical residential, industrial, farmstead and livestock needs. Refinement of the existing WHPA delineation due to the addition of a new well may result in an alteration of the WHPA. The City will request that the DNR provide notification to the city when high capacity well applications are received.
- B.) ***Expected Changes in Land Use:*** Any changes in land use within the near future will most likely come as a result of more land easement programs and implementation of agricultural Best Management Practices (BMP). These changes in land management are expected to have a positive impact in the DWSMA of the Windom well field

over the next 10 years. Ground water monitoring over the next 10 years will track any impact these changes in land usage may have on ground water quality.

- C.) ***Influence of Existing Water and Land Government Programs and Regulation:*** Cottonwood County implements county feedlot and sewage treatment regulations. Over the next ten years, these regulations should have a positive impact on water quality within the DWSMA. Cottonwood County is currently reviewing their comprehensive plan. The City of Windom encourages the County to formally recognize wellhead protection areas and provide additional measures to address noncomplying septic systems, storage tanks and other potential contaminant sources within the DWSMA that would also benefit the Windom drinking water source. The County should take into consideration the DWSMA area when granting feedlot permits and when developing manure management plans.
- D.) ***Administrative, Technical, and Financial Considerations:*** WPWSS appointed a Wellhead Protection Committee early in the process of developing a plan. Much of the activities during the planning process have been accomplished through efforts of this group, with assistance from studies provided by other units of government. For this plan to be effective WPWSS will need to rely upon Cottonwood County to enforce land use ordinances within areas of the DWSMA that are outside municipal boundaries. Day to day administrative duties will be the responsibilities of the Wellhead Protection Manager. The Wellhead Manager will be responsible for reporting wellhead related activities to the Windom Utility Commission, coordinating implementation activities and conducting regular meetings. The committee, WPWSS staff, and various cooperating local, state and federal agencies will implement wellhead protection strategies developed by the Wellhead Protection Committee. To complement funds from existing resource management programs administered by cooperating agencies, WPWSS has dedicated funds to implement wellhead protection activities.

# **CHAPTER THREE**

## **ISSUES, PROBLEMS, AND OPPORTUNITIES (4720.5230)**

### **I. Land Use Issues, Problems, and Opportunities Related to:**

#### **A. The Aquifer**

The vulnerability of DWSMA for the City of Windom was determined by evaluating available information on geologic materials overlying the aquifers and the groundwater flow model. Delineation of the wellhead protection area includes two components 1) the portion of the outwash channel aquifer included in the capture zone for the city wells, and 2) the surface water runoff area that provides recharge to the outwash channel aquifer. The vulnerability of these two areas differs because the channel aquifer is not present in most of the surface water runoff area. Here, clay-rich glacial deposits are present and surface water does not readily move vertically to recharge groundwater resources. Therefore, the composition of the glacial deposits within the DWSMA are evaluated to determine where clay-rich versus highly permeable sediments occurred below the soil horizon.

The MDH Well Vulnerability Assessments for each of the municipal wells were reviewed. It was determined that of the eight wells only wells 5, 7, and 8 are considered vulnerable. City of Windom wells 5, 7, and 8 were determined to be relatively vulnerable to contamination from activities at the land surface. This evaluation is based on factors such as the geologic sensitivity at these sites. The geologic sensitivity of the surficial glacial outwash aquifer is high because no low-permeability materials, such as clay or till, that might slow the vertical migration of contaminants at the land surface overlie the majority of this site.

Because of limitations (limited infrastructure, domestic water use priorities, aquifer considerations and current water quality) to WPWSS ability to supply additional quantities of water, added major commercial development requiring large quantities of water may be also limited within the system and Cottonwood County. Water quantity and quality issues are directly tied to future land use planning and management.

#### **B. The Water Well**

No changes are anticipated in the number of wells in the well field. The City of Windom and Red Rock Rural Water have developed a relationship and currently the City is providing water to Red Rock Rural Water for their customers. Red Rock Rural Water is currently pursuing additional sites for potential water sources. Red Rock Rural Water has been involved in helping to develop the Windom WHP Plan.

The City of Windom's well water quality is of good quality. Presently, no contaminant levels have been reported that exceed maximum contaminant levels set by the Federal Safe Drinking Water Standards.

The vulnerability of the area where the outwash channel aquifer is present is designated high because there appears to be no laterally persistent layers of the fine-grained geologic materials to retard or prevent the vertical movement of water-borne contaminants. Elsewhere, the vulnerability of the DWSMA is designated as low because clay-rich glacial deposits are the predominant sediment type. Sand and gravel bodies may occur within these deposits, but are likely to be very localized and not in direct contact with the outwash channel aquifer.

The vulnerability of City wells was determined by evaluating available information on the geology and well construction. Based on a review of the local geology, there is no known condition that threatens well integrity. Well construction information indicates that proper materials were installed and the construction is non-vulnerable.

### **C. The DWSMA**

The boundaries of the DWSMA will probably not change due to the relationship of runoff water and the identified critical area of the aquifer. The introduction of a high capacity well within or near the DWSMA may alter the delineation of the capture zone and would therefore require additional study to determine what impacts the new well may have on the capture zone. Sources of potential contaminants such as individual sewage treatment systems, pesticides, petroleum spills and household related wastes are issues that need attention also. The Primary Management Area coincides with high vulnerability areas and implementation will focus on these items.

Therefore, land use activities throughout the watershed must be considered for their potential impacts on the quality of runoff water and resulting recharge water to the aquifer. Cottonwood County and WPWSS will continue with monitoring of selected water quantity and quality parameters within the watershed and aquifer and will continue, via a unified effort put forth by the County, MPCA and WPWSS.

## **II. Identification and assessment of:**

### **A. Problems and opportunities discussed at public meetings or submitted in written comment**

The Windom Wellhead Protection Committee has discussed the issue of placement of new feedlots within the DWSMA. Also, the Committee has discussed management of onsite sewage treatment systems, feedlots, wells, spills and storage tanks within the DWSMA. This includes unsewered property that was identified by the committee located on the east side of Cottonwood Lake.

The Committee has discussed concerns with continued permit compliance by PM Windom. The Committee agreed that inventory and identification of potential contaminant sources would be a continuing effort.

## **B. Data elements**

The hydraulic interconnection between the aquifer and the surface water directly impact the public water supply wells used by the City of Windom. This link was determined during preliminary findings of a recent study by the United States Geological Service (USGS). The study's final report has concluded at this time it has not been published. Monitoring of city wells will be ongoing. Additional information maybe gathered regarding the relationship between surface water and ground water.

## **C. Status and adequacy of official controls, plans, and other local, state and federal programs on water use and land use**

The City of Windom regulates the connection of private water supplies to the water system. City Code requires the connection to municipal water and sewer main for any dwelling or business building in which property is within 100 feet of any municipal water and sewer main. Where City sewer and water facilities are not available for extension the Council may permit the use of individual water and sewer systems in accordance with all appropriate State and local regulations. The City of Windom is in the process of updating their comprehensive land use plan. A DWSMA/WHP map will be incorporated into the plans and consideration will be given to the WHP area located within the county and city limits.

Cottonwood County regulates the size and placement of feedlots; the county has adopted state septic system standards and recognizes wellhead protection areas and their associated DWSMAs. State Shoreland rules also apply to shoreland areas. The county has targeted upgrading septic systems as a high priority in a DWSMA. The County as well as the city will be relaying on the state to implement proper permitting for PM Windom.

Federal agricultural land conservation programs such as the Conservation Reserve Program and similar programs are available to local landowners. Enrollment is quite high in the area and is being heavily promoted within the watershed. The well inventory and potential contaminate source inventory will be an ongoing process that will require updating as information is obtained.



# **CHAPTER FOUR**

## **WELLHEAD PROTECTION GOALS (4720.5240)**

**The overall GOAL of the WPWSS – WINDOM Well Field Wellhead Protection Plan is to promote public health, economic development and community infrastructure by maintaining a potable drinking water supply for all customers of the WPWSS service area, both now and into the future.**

The Windom Wellhead Protection Committee has determined protecting the Windom aquifer requires a multiple tiered approach. Most efforts will be concentrated in developing educational outreach programs for watershed residents. Additional efforts will be made to work with various levels of government to provide incentives and mechanisms to reduce potential containment sources. The committee also recognizes the need for an ongoing monitoring program to collect water quality data and determine if implementation efforts are effective.

Due to the nature of the geology and the aquifer where the wells are located, pesticide management, proper management and operation of domestic shallow well disposal and commercial wells, soil conservation practices, prevention of spills related to above and underground storage tanks, non-compliant septic systems, identification of critical transportation corridors, and hazardous waste issues are also priority items.

A vital aspect of successfully implementing a meaningful wellhead protection plan is public support. The committee recognizes this fact and will promote broad-based educational efforts within the DWSMA. These efforts will cover nutrient management, home and farm solid waste management, well management, sewage treatment and other topics related to protecting ground waters from potential contaminant sources.

Finally, it is important to maintain a monitoring network of both surface and ground waters within the watershed. Data collected from a properly designed monitoring system can provide the WPWSS wellhead protection committee and partners with important information regarding the drinking water source waters. This in turn can aid in determining if additional research projects may be needed and if implemented wellhead protection strategies are effective.

**The Windom Wellhead Protection Committee has identified the following goals for implementing the Windom wellhead protection plan:**

**GOAL 1: Protect the public water supply from potential contaminant sources due to land use activities.**

**Rationale:** The contaminant source inventory for the Windom Wellhead Protection area identified several potential sources to be concerned about as potential threats to the drinking water. These include various land uses associated with manure storage and usage, above and underground tanks, agricultural chemical storage, non-complying septic systems, petroleum tank, leaks or spills, dump sites, hazardous waste generator sites, and wells. The promotion and adoption of Best Management

Practices (BMP) and adherence to state and local regulations have been identified as the most cost effective approach to addressing these potential contaminant sources.

**GOAL 2: Establish and maintain a WHP continuing public education and information program.**

**Rationale:** The Windom Wellhead Protection Committee has identified the need to support a comprehensive WHP educational plan. The committee has identified a number of educational activities, which collectively, can add up to significant accomplishment toward advancing the public and private sectors' perception about protecting drinking water. There is a need for creation of a dedicated policy between City of Windom and federal, state and local units of government to support regular activities of drinking water protection education.

**GOAL 3: Establish and maintain a comprehensive surface and ground water monitoring program.**

**Rationale:** Although a monitoring network exists in the Windom DWSMA, there is no cohesive monitoring and data management plan. Without a comprehensive plan to collect data, store and retrieve data, conduct data analysis and disseminate collected data, monitoring efforts may become ineffective and the goals and objectives of this plan may not be achieved.

# **CHAPTER FIVE**

## **OBJECTIVES AND PLANS OF ACTION (4720.5250)**

### **I. Establishing Priorities**

The WPWSS WHP Committee considered the following factors in developing priorities to address potential contaminant sources within the Windom DWSMA:

- Contamination of the public water supply wells by substances that exceed federal drinking water standards
- Quantifiable levels of contamination resulting from human activity
- The location of potential contaminant sources relative to the well(s)
- The number of each potential contaminant source identified and the nature of the potential contaminant associated with each source
- The capability of the geologic material to absorb a contaminant
- The effectiveness of existing controls
- The time required to get cooperation from other agencies and cooperators
- The resources needed: staff, money, time, legal, technical

As discussed in Chapter 3, the Windom aquifer has been determined to be vulnerable to contamination. In response, the WHP Committee split the DWSMA into two zones for management purposes. Abandoned wells, noncomplying septic systems, above and underground fuel tanks and accidental spills also pose a threat to the aquifer. Therefore, the Wellhead Protection Committee would like to concentrate first on implementing the following objectives and measures in primary management area, which is the most vulnerable portion of the aquifer. The listed objectives and measures are also applicable to secondary management area and should be implemented over the course of the wellhead plan. The WHP Committee feels the implementation of these management strategies will help create public awareness within the aquifer and aid in preventing future contamination of the aquifer.

- A. WHP Education & Awareness:
- B. Agricultural and Urban Land Use and Turf Management Best Management Strategies:
- C. Well Management:
- D. Chemical, Fuels, and Hazardous Material Management:
- E. Transportation Corridor & Spills:
- F. Data Collection:
- G. Wellhead Protection Recognition & Planning:

### **A. General Public Educational Activities**

**Objective A1** – Create awareness and general knowledge about the importance of WHP in Windom Community and DWSMA. Establish a public education program using newsletters, signs,

mailings to landowners, etc. to educate citizens about how land use activities affect groundwater quality and the City of Windom Public Water Supply Wells.

**WHP Measure A1-1:** Develop and release periodic items to the local news media regarding WHP efforts. Topics could range from describing WHP, highlighting various management strategies/topics found in this plan. Public Service Announcements on a variety of WHP topics are available through a MRWS or MDH Planner.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District, Minnesota Department of Health (MDH) and Minnesota Rural Water Association (MRWA).

*Time Frame:* Ongoing with plan adoption

*Estimated Cost:* Staff time

*Goal Achieved:* Citizens in the DWSMA and Windom Community become aware of the wellhead protection program.

**WHP Measure A1-2:** Install information WHP signs at the perimeter of the wellhead protection area and on major roadway corridors to alert the public of the WHP area.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):*

*Time Frame:* Spring 2005.

*Estimated Cost:* 8 signs @ \$25.00 each = \$200.00

8 posts @ \$15.00 each = \$120.00

*Goal Achieved:* Residents become aware of the location of the wellhead protection area and are conscious of their actions within the protection area.

**WHP Measure A1-3:** Develop and distribute information explaining the purpose of the WHP Plan to landowners and farm operators in the DWSMA through a direct mailing. Also, make this information available to citizens served by the water system and the general public through local outlets such as City Hall, etc.

*Source of Action:* WHP Manager, WHP Team.

*Cooperator(s):* Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District, Minnesota Department of Health (MDH) and Minnesota Rural Water Association (MRWA).

*Time Frame:* Winter 2004, repeat as needed

*Estimated Cost:* \$100

*Goal Achieved:* Landowners and farm operators become informed about WHP, resulting in public acceptance and buy-in to the Plan.

**WHP Measure A1-4:** Annually discuss and determine areas of joint interest and collaboration with the Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District and other communities implementing WHP to avoid duplication and compliment efforts. Some programs and activities could be collaborated on to save time and

money. This could include promotion of Ag related educational events where WHP activities could be highlighted, educational packets for landowners, etc.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Other communities implementing WHP, Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District.

*Time Frame:* Beginning Winter 2004, annually thereafter.

*Estimated Cost:* Staff time

*Goal Achieved:* Improve collaboration on groundwater issues between the City of Windom, Neighboring communities, the County and SWCD. Create efficiencies; avoid duplication of efforts in the implementation of the WHP & groundwater protection.

**WHP Measure A1-5:** Work with the U.S. Fish & Wildlife Services (USFWS), DNR, Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District, Extension, MDA and other resource partners to promote awareness about ground water resources, wellhead protection (WHP) efforts and groundwater related activities and programs that may be identified in the County Water Plan. This may include participation, hosting, sponsoring or assisting with local events or festivals, Earth Day or similar County or SWCD events; and other opportunities to; promote WHP in the Windom community.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Cottonwood County Environmental Services, Red Rock Rural Water, Cottonwood Soil & Water Conservation District, Minnesota Department of Health (MDH) and Minnesota Rural Water Association (MRWA), Local teachers and students.

*Time Frame:* Annually

*Estimated Cost:* \$150

*Goal Achieved:* Teachers, students, parents and the general public become more aware of the issues involved with protecting the local water supply.

**WHP Measure A1 - 6:** Develop a comprehensive packet of "fact sheets" on farm site and household best management practices that will be distributed to DWSMA residents. This packet can be used as the basis for a variety of news releases and information. Most of these fact sheets are already in print and can be obtained through the county, extension, MDA, MDH etc. The packets will contain information on:

- 1) The importance of abandoned well sealing and cost share or financial incentives available for well sealing,
- 2) Proper well maintenance for private wells located in the DWSMA,
- 3) Above and below ground tanks, fuel storage and containment best management practices,
- 4) Household hazardous waste management and disposal,
- 5) Proper farm chemical storage, management and disposal options,
- 6) The importance of sewage treatment, local septic system requirements and the availability of low interest loans or their financial opportunities to upgrade on-site septic systems.
- 7) Information on hazardous spill management containment and contact information.

- 8) A local directory of contacts of “who” and “where” more information can be obtained on the information above will be included.

*Source of Action:* WHP Manager, WHP team.

*Cooperator(s):* City of Windom, Cottonwood County Environmental Services, SWCD, County Solid Waste Dept., Extension, MDA, MPCA, MDH, MRWA.

*Time Frame:* Winter-Spring 2004-2005; on going as needed

*Estimated Cost:* \$10.00 per packet & Staff time.

*Goal Achieved:* Raise awareness among rural residents in the DWSMA regarding WHP issues and best management practices that can be implemented.

**WHP Measure A1 - 7** – Distribute educational material pertaining to the construction, operation, and maintenance of on-site sewage treatment systems in the DWSMA. On-site septic system brochures can be obtained from the Cottonwood County Extension Service.

*Source of Action:* WHP Manager, WHP team.

*Cooperator(s):* U of M Extension, Cottonwood County Environmental Services

*Time Frame:* -Spring 2005; on going as needed

*Estimated Cost:* \$4.00 per Extension Septic System Brochure & Staff time.

*Goal Achieved:* Create citizen awareness regarding the importance of properly constructed and maintained sanitary systems. Educate landowners in the DWSMA about the importance of compliant septic systems in protecting groundwater.

## **B. Agricultural and Urban Land Use Activities**

**Objective B1** Advocate and create awareness about the importance of agricultural conservation programs available and best management practices that will protect and improve groundwater quality in the DWSMA.

**WHP Measure B1 - 1:** Mail a letter/brochure to crop producers in the DWSMA about WHP and the need for good nutrient management practices and application rates when applying manure or commercial fertilizers. With the assistance of the Cottonwood County SWCD, create awareness about all the Conservation Programs available to agricultural property owners in the DWSMA. Work cooperatively with the NRCS and Cottonwood County SWCD to create awareness about these programs through personal correspondence or direct mailings.

*Source of Action:* WHP Team and Manager.

*Cooperator(s):* Farmers and agricultural producers located in the DWSMA. MN Rural Water can provide a brochure on WHP and assist with this measure. Cottonwood County SWCD, MDA, NRCS.

*Time Frame:* Winter 2004. As needed in the future

*Estimated Cost:* Staff time and postage

*Goal Achieved:* Ag producers become aware of WHP and the importance of protecting the local community's water supply. Area Agricultural producers become informed about programs that may suite their operation and benefit WHP efforts.

**WHP Measure B1 - 2:** Provide direct promotion and distribution of information regarding existing workshops, field demonstrations and programs conducted by Cottonwood County SWCD and the Natural Resource Conservation Service (NRCS) to producers located in the DWSMA. Topics to be specifically promoted include nitrogen, chemical, manure and other nutrient and tillage crop management activities. The WHP Manager should contact local resource offices and staff annually and request to be notified regarding workshops to be held in the County to promote to producers in the DWSMA. The MN Dept of Agriculture also has information and may provide assistance to the WHP Manager. A list of Ag producers in the DWSMA will be kept on file for future reference and mailings.

*Source of Action:* WHP Team and Manager.

*Cooperator(s):* Cottonwood Co. Environmental Services, Cottonwood County SWCD, NRCS, and MDA.

*Time Frame:* Winter 2004, annual on-going activity

*Estimated Cost:* Staff time and postage

*Goal Achieved:* Area Agricultural producers become informed about best management practices that will improve their operation and provide protection of the community's drinking water supply. The WHP Manager & Team become aware of agriculture programs and activities offered in the area that will protect drinking water supplies.

**WHP Measure B1 - 3:** Work with the Cottonwood County Environmental Services and SWCD Staff to promote and distribute information on manure best management practices for producers applying manure in the DWSMA. Topics to include county feedlot permit requirements regarding manure application and management. Request that Cottonwood County place priority on manure management activities in the Windom DWSMA.

*Source of Action:* WHP Team and Manager.

*Cooperator(s):* Cottonwood Co. Environmental Services, Cottonwood County SWCD, and MDA.

*Time Frame:* Winter 2004, annual on-going activity

*Estimated Cost:* Staff time and postage.

*Goal Achieved:* Area livestock producers become informed about the best management practices that benefit their farming operation and provide protection of the community's drinking water supply.

**WHP Measure B1 - 4.** Create awareness of City of Windom residents, business owners, and cemetery caretakers, regarding storm water pollution.

*Source of Action:* WHP Team and Manager.

*Cooperator(s):* City of Windom, Red Rock Rural Water, Cottonwood Co. Environmental Services, Cottonwood County SWCD, MDH.

*Time Frame:* Winter -Spring 2004-2005, annual on-going activity

*Estimated Cost:* Staff time and postage.

**Goal Achieved:** City of Windom Residents become aware of how their actions affect their drinking water quality and how they can help protect the City of Windom's water quality.

**WHP Measure B1 - 5:** Promote the importance of proper lawn care fertilization and chemical use best management practices in the DWSMA that will provide protection of the public drinking water supply.

**Source of Action:** WHP Manager

**Cooperators:** SWCD, Cottonwood County Extension Office and / or MDA for information on proper turf management.

**Time Frame:** Spring 2005

**Estimated Cost:** \$200 for brochures and mailing

**Goal Achieved:** Proper application of lawn care products and awareness of WHP efforts.

## **C. WELL MANAGEMENT**

**Objective C1:** Educate and promote proper well management in the DWSMA. Identify new wells that may be constructed within the DWSMA or existing wells that may have not been identified at this time. Promote proper well management and sealing of wells not in use.

**WHP Measure C1-1:** The City of Windom will promote the sealing of abandoned wells within the DWSMA. This may be accomplished through local news releases, etc. The promotion of the availability of cost share funding options will be explored through the Cottonwood County SWCD and Environmental Services to ease the financial burden on private landowners.

**Source of Action:** WHP Manager, WHP Team

**Cooperator(s):** SWCD, Cottonwood County Environmental Services, and landowners

**Time Frame:** Ongoing Activity with plan adoption.

**Estimated Cost:** Staff time to promote well sealing programs.

**Goal Achieved:** Private well owners become aware of the dangers of unused wells.

Abandoned or unused wells are sealed.

**WHP Measure C1-2:** The MDH Well Management brochure will be distributed and made available to private well owner(s) to promote proper maintenance and management of existing wells that are located within the DWSMA. Provide information to well owner(s) regarding the need for refraining from mixing or handling farm chemicals near wells.

**Source of Action:** WHP Manager, WHP Team

**Cooperator(s):** Well owners, MDH, MDA, MRWA

**Time Frame:** Summer 2004, ongoing as needed

**Estimated Cost:** Staff Time and cost to copy & distribute brochures & information



*Goal Achieved:* Private well owners become aware of why proper well management is important and how to protect and manage a well to lessen the threat of contamination.

**WHP Measure C1-3:** The City will continually attempt to locate existing wells or new wells in the DWSMA. This will be accomplished by: 1) notifying area well drillers regarding the location of the WHPA / DWSMA of the City of Windom and request to be notified when a well is constructed or repaired in this area and 2) the on-going identification of wells by the WHP Manager through personal contact with private landowners. Landowners are subsequently made aware of WHP and proper well maintenance.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Area Well Drillers, MDH, landowners with a new or existing well

*Time Frame:* Ongoing Activity

*Estimated Cost:* Staff Time and cost of mailing

*Goal Achieved:* Wells are identified and private property owners become aware of WHP and proper well management.

**WHP Measure C1-4:** Collaborate with the MDH Source Water Protection Unit and the MDNR Water Appropriations Program in the identification of new high-capacity wells that are proposed for construction within the DWSMA. The WHP Manager will alert the MDH upon learning about the construction or use of a high capacity well in the DWSMA. Potential impacts will be evaluated by MDH.

*Source of Action:* WHP Manager, WHP Team, MDH, MDNR Cooperator(s): Well Drillers, Well Owners

*Time Frame:* Ongoing Activity with plan adoption

*Estimated Cost:* Staff Time .

*Goal Achieved:* New high capacity wells will be identified and evaluated as to their impact on the Windom public water supply wells and existing WHPA and DWSMA delineation's.

#### **D. CHEMICALS, FUEL AND HAZARDOUS MATERIAL MANAGEMENT:**

**Objective D1:** Provide information to landowners in the DWSMA about the proper handling of chemicals and proper disposal of unused product and containers.

**WHP Measure D1-1:** Provide information to landowners about the importance of proper handling and management of chemicals in the DWSMA. Work with Cottonwood County Solid Waste Services to highlight local container drop off and disposal programs. MDA has brochures and information highlighting proper handling of Ag chemicals and management activities.

*Source of Action:* WHP Manager, WHP Team,

*Cooperator(s):* Cottonwood County Environmental Services, MDA, and landowners

*Time Frame:* Spring 2004 (Use or include this information in packet described under A-6)  
*On-going Activity as needed.*  
*Estimated Cost:* Staff Time, Postage and copying costs  
*Goal Achieved:* Landowners become aware of the importance of proper handling and management of Ag chemicals in the DWSMA.

**Objective D2:** Provide landowners information about the importance and opportunities available for the proper disposal of household hazardous waste (paint, chemicals, cleaners, etc.) available in Cottonwood County.

**WHP Measure D2-1:** Participate in a local County sponsored hazardous waste drop off event in the City and / or townships included in the DWSMA. Work with County Solid Waste Services or County Hazardous Waste Staff in obtaining and providing local information on the importance of proper management and disposal of hazardous waste.

*Source of Action:* WHP Manager and WHP Team  
*Cooperator(s):* Cottonwood County Household Hazardous Waste Collection Program, MPCA.  
*Time Frame:* Spring of 2004. Annual on-going program. (Include or use information gathered in packet described under A 1-7)  
*Estimated Cost:* Staff time to coordinate event.  
*Goal Achieved:* Hazardous materials are disposed of properly. The likelihood of improper chemical or container disposal is reduced.

**Objective D3:** Provide information about WHP to businesses handling hazardous materials. Provide them with information about proper handling and disposal of hazardous materials and steps they can take to help protect the city public water supply wells.

**WHP Measure D3-1:** Provide information to businesses using or generating hazardous waste about WHP efforts and things they can do to minimize hazardous waste. Obtain information from Nobles County environmental Services on local disposal options and technical services available from MN Technical Assistance Program (MNTAP) for recycling and reducing hazardous materials.

*Source of Action:* WHP Manager  
*Cooperator(s):* Businesses, Cottonwood County, MNTAP  
*Time Frame:* Winter of 2005  
*Estimated Cost:* Staff time.  
*Goal Achieved:* Businesses become informed about WHP and opportunities to reduce and properly dispose of hazardous materials.

**Objective D4:** Create awareness about WHP efforts and activities among owners of above and below ground petroleum tanks. Inform them that their facility is located in the City of Windom DWSMA and the importance of proactive measures to protect groundwater in this area. Remind

them of the importance of promptly addressing any leaks detected through monitoring of product levels and the importance of spill prevention and quick response in the event of a spill.

**WHP Measure D4-1:** Provide a brochure to businesses with registered storage tanks (RST's) describing what WHP is, and tank monitoring and management information available through MPCA. Provide information regarding proper containment areas for above ground tanks and spill response and clean-up information available through MPCA.

*Source of Action:* WHP Manager and WHP Team

*Cooperator(s):* Businesses with RST's, MPCA

*Time Frame:* Winter of 2005.

*Estimated Cost:* Staff time.

*Goal Achieved:* Reduce the potential adverse impacts of RST's and potential spills associated with their use on public water supply wells. Educate businesses about WHP efforts and groundwater protection.

**Objective D5:** Request to be notified and a point of contact regarding clean-up or problems associated with leaky underground storage tanks (LUST's) and RST's in the DWSMA by the MPCA Tanks Unit.

**WHP Measure D5-1:** Contact MPCA tanks unit and provide them with a map of the DWSMA. Request to be notified regarding any changes in the on-going monitoring or abatement activities associated with any of the LUST's identified in the DWSMA which may impact the public water supply wells. Request to be notified in the event of a problem regarding any of the existing RST's identified in the DWSMA.

*Source of Action:* WHP Manager

*Cooperator(s):* MPCA

*Time Frame:* Winter of 2005.

*Estimated Cost:* Staff time.

*Goal Achieved:* Improved communication about tank sites and potential negative impacts of these sites between the regulatory agency (MPCA) and the public water supplier. Proactive steps are or can be taken in regards to any change in tank status, release of product or change in migration of a product from an existing site which may impact the public water supply wells.

**Objective D6:** Create awareness among commercial enterprises, local automotive shops or garages about what a Class V well is and Federal EPA registration, permitting and reporting requirements for Class V Wells. In the event a Class V well is identified, provide information to the landowner on alternate disposal and management options.

**WHP Measure D6-1:** Provide information to commercial businesses, local automotive or rural repair shops, and public facilities in the DWSMA a Fact Sheet on Class V Wells and reporting requirements. Inform them of how shallow disposal systems can impact groundwater quality and their obligations to report and Register Class V Wells with EPA. (Class V Wells fact sheets will be

provided by MDH or MRWA Planner). EPA reporting forms are available at: [www.epa.gov/safewater/uic/7520s.html](http://www.epa.gov/safewater/uic/7520s.html).

*Source of Action:* WHP Manager

*Cooperator(s):* MDH, MRWA Planners, Landowners

*Time Frame:* Summer of 2005.

*Estimated Cost:* Staff time, postage & coping costs

*Goal Achieved:* Landowners become informed about federal Class V Well requirements and impacts on groundwater quality.

**WHP Measure D6-2:** Provide information to landowners where a Class V well is identified, on technical services available thru MNTAP to assess management and / or disposal alternatives. Provide them with local contacts for permitting information for the City of Windom and Cottonwood County.

*Source of Action:* WHP Manager

*Cooperator(s):* MDH, MRWA Planners, Landowners, MNTAP

*Time Frame:* Summer of 2005.

*Estimated Cost:* Staff time, postage & coping costs

*Goal Achieved:* Alternative management strategies for Class V Wells are identified and the potential for groundwater contamination is reduced.

## **E. TRANSPORTATION CORRIDOR & SPILLS:**

**Objective E1:** Create awareness about the WHP area along transportation corridors. Protect the groundwater and public water supply wells from possible contamination from accidental spills along roads and right of ways. Alert local emergency responders about the location of the DWSMA and WHP efforts.

**WHP Measure E1-1:** Post WHP signs along County and Township roads. (See measure A-2). Notify Township and County Highway Department about the posting of signs along road R.O.W.'s. Mail them a map of the DWSMA and through correspondence; inform them of the need for consideration of this area when completing road construction projects and maintenance (i.e. storm water or diversions, fuel and construction equipment management and maintenance, chemical use, etc.)

*Source of Action:* WHP Manager

*Cooperator(s):* Township, County Highway Department

*Time Frame:* Spring, 2004

*Estimated Cost:* Staff time, postage, installing sign.

*Goal Achieved:* Road construction and maintenance efforts consider activities which may be detrimental to groundwater and WHP efforts in the area. Signs are posted to remind road maintenance crews about the WHP area.

**Objective E2:** Create awareness regarding the location of the WHP area among State and local emergency responders.

**WHP Measure E2-1:** Through direct correspondence with the County Emergency Manager, Local Fire Department, MPCA, and first responders alert them to the location of the DWSMA by providing them a map, describing the placement of signs along transportation corridors and inform them of City WHP efforts. Request that strong consideration to the WHP area be given when responding to a spill. √

*Source of Action:* WHP Team/Manager.

*Cooperators:* Local Fire Departments, County Emergency Manager & responders, MPCA Spills Unit

*Time frame:* Fall, 2004

*Funding:* Staff time, postage

*Goal Achieved:* Spills and releases of hazardous materials will be promptly addressed by State and local responders.

**Objective E3:** Create awareness of the importance of proper handling and transportation of chemicals and fertilizers at the local Co-op. Provide the Co-op with information regarding the importance of spill prevention and response.

**WHP Measure E3-1:** Inform managers and patrons at the local Co-op of the importance of proper handling and transporting chemicals and fertilizers. Inform them of the precautions needed when filling equipment and transporting products to and from the Co-op. Provide information about the importance of spill prevention and response and the importance of WHP efforts. Information on this topic can be obtained from the MDA. Provide a map of DWSMA.

*Source of Action:* WHP Team/Manager.

*Cooperators:* Coop Managers, Co-op Board of Directors, Patrons, MDA

*Time frame:* Fall, 2004

*Funding:* Staff time

*Goal Achieved:* Reduce the potential for accidental spills through awareness among Co-op managers and patrons.

**WHP Measure E3-2:** Create awareness about the location of the DWSMA and WHP efforts to operators of the Railway. Provide a map of DWSMA. Inform them of the precautions needed when transporting products and the importance of spill prevention and response in this area.

*Source of Action:* WHP Team/Manager.

*Cooperators:* Operators of the Railway

*Time frame:* Fall, 2005

*Funding:* Staff time

*Goal Achieved:* Reduce the potential for accidental spills through awareness among railway operators.

## **F. DATA COLLECTION:**

**Objective F1:** Gather additional water quality and quantity information described in Part I of the WHP Plan to further substantiate the influence of the lakes and waterway in the WHPA / DWSMA on the quality and quantity of water produced by the Windom Public Water Supply Wells. (See Part I of the WHP Plan;)

**WHP Measure F1-1:** Contact and work with the MDH Hydro Geologist, DNR Hydrologist and USGS in the collection of additional hydrologic data useful in future refinements of the Windom WHPA and DWSMA. Based on MDH Hydro Geologist recommendations in Part I of the WHP Plan collect water samples from the lakes and waterway to determine the level of influence on the quality and quantity of water produced by the Windom Public Water Supply Wells.

*Source of Action:* WHP Manager

*Cooperator(s):* MDH Hydro Geologist, USGS, DNR Hydrologist

*Time Frame:* Summer 2005 or time frame established with MDH Hydro Geologist & USGS

*Estimated Cost:* Staff time

*Goal Achieved:* Refinements in future delineation efforts and protection strategies can be accomplished through further information about the influence of the lakes and waterways.

**WHP Measure F1-2:** Contact and collaborate with the MDH Source Water Protection Unit Hydro Geologist when conducting any future pump tests, test drillings, or studies which may benefit WHP efforts and local geologic knowledge.

*Source of Action:* WHP Manager

*Cooperator(s):* MDH Hydro Geologist

*Time Frame:* Ongoing Activity

*Estimated Cost:* Staff time

*Goal Achieved:* Refinements in future delineation efforts and protection strategies can be accomplished through further aquifer and geologic information.

**Objective F2:** Gather new well construction logs by working with area well drillers which may help substantiate aquifer boundaries and improve future delineation efforts and knowledge about the aquifer. (Also see C1-4)

**WHP Measure F2-1:** Gather new well construction logs by working with area well drillers. This can be accomplished through personal contact or correspondence on a bi-annual basis with local well drillers to see if any new wells were constructed within a 2-mile radius of either well field site. Well logs may also be available through the Cottonwood County SWCD and Cottonwood County Environmental Services. (See C1-4)

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Well Drillers

*Time Frame:* Biannually, Ongoing Activity

*Estimated Cost:* Staff time

*Goal Achieved:* More well logs and information are collected to better define local hydrologic conditions, which will improve future delineation efforts and WHP activities.

## **G. WELLHEAD PROTECTION RECOGNITION & PLANNING:**

**Objective G1** -Identify Wellhead Protection (WHP) and the delineation's completed (DWSMA) in future revisions to local land use and resource planning / documents. Consideration should be given to how future land uses or changes may impact local groundwater resources and the City of Windom's public water supply.

**WHP Measure G-1:** Request that the DWSMA be identified in the Cottonwood County & City of Windom Planning and Zoning Comprehensive Local Water Management Plan and Comprehensive Land Use Management Plan, maps and official controls when changes are made to these documents in the future. Applicable protection strategies and ways to protect groundwater resources as identified in this plan may also be considered.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Cottonwood County Environmental Services, City of Windom Planning and Zoning, SWCD, Watershed District, and Elected Officials.

*Time Frame:* As revisions are made to these documents. Ongoing Activity.

*Estimated Cost:* Staff time

*Goal Achieved:* WHP is recognized in local planning and land use management decisions. Proactive steps may be taken to protect local groundwater resources as needed and identified through this planning effort.

**WHP Measure G-2:** Request that Cottonwood County Environmental Services notify the City of Windom regarding changes in land use and permit requests in the DWSMA that may potentially impact the public water supply wells and groundwater quality.

*Source of Action:* WHP Manager, WHP Team

*Cooperator(s):* Cottonwood County Environmental Services

*Time Frame:* Winter 2004, on-going activity

*Estimated Cost:* Staff time

*Goal Achieved:* City of Windom is made aware of land use decisions being considered in the DWSMA which may affect groundwater quality and the public water supply wells.

# **CHAPTER SIX**

## **EVALUATION PROGRAM (4720.5270)**

The success of the wellhead protection source management strategy must be evaluated in order to determine whether the plan is actually accomplishing what the Wellhead Protection Committee set out to do.

The following activities will be implemented to:

- Track the implementation of the objectives identified in the previous section of this plan;
- Determine the effectiveness of specific management strategies regarding the protection of the City of Windom water supply;
- Identify possible changes to these strategies that may improve their effectiveness.
- Determine the adequacy of financial resources and staff availability to carry out the management strategies planned for the coming year.

The Wellhead Protection Plan Manager will drive through the drinking water supply management area on a monthly basis to identify any changes in land use or contaminant source management practices, which may adversely impact the water supply.

The Wellhead Protection Planning Committee will meet periodically on an as-needed basis, to review the results of each strategy and identify whether modifications are needed.

The Wellhead Protection Plan Manager will present an annual report to the City of Windom City Council regarding progress in implementing the wellhead management objectives. The intent of the annual reports is to compile a comprehensive study of the implementation of the source management strategies when WPWSS system's wellhead protection plan is updated in 10 years. Copies of the annual written WHP report will be distributed as follows:

- MDH
- Windom Utility Commission and City Council
- WPWSS – Windom Well Field WHP File
- MRWA
- Cottonwood County Environmental Services
- Soil & Water Conservation District



## **CHAPTER SEVEN**

### **ALTERNATIVE WATER SUPPLY; CONTINGENCY STRATEGY (4720.5280)**

The City of Windom WATER SUPPLY CONSERVATION PLAN has been submitted and approved by the DNR, Division of Waters, Appropriation Permit Program. This approved plan contains the required elements of the Wellhead Protection Rule and is accepted as an equivalent to an Alternative Water Supply/Contingency Plan as defined in 4720.5280. Implementation of the Plan has begun with the Aid and Assistance of local emergency management agencies. A copy of the plan is available for review at the City of Windom Water/Wastewater Department or by contacting Michael Haugen, Water/Wastewater Superintendent.

# **Appendix**

## **REFERENCED DATA FOR PART 2**

### **Figures**

<b>Figure 1</b>	<b>Map of WHPA/DWSMA</b>
<b>Figure 2</b>	<b>Soil Map</b>
<b>Figure 3</b>	<b>Flood Plain Map</b>
<b>Figure 4</b>	<b>Land Use Map</b>
<b>Figure 5</b>	<b>Zoning Map</b>
<b>Figure 6</b>	<b>1990 Land Use Classification</b>
<b>Figure 7</b>	<b>Conservation Set Aside Acres</b>
<b>Figure 8</b>	<b>Transportation Corridors</b>
<b>Figure 9</b>	<b>Waterbodies in DWSMA</b>

### **Exhibits**

<b>Exhibit A</b>	<b>Potential Containment Source Inventory &amp; Maps</b>
<b>Exhibit B</b>	<b>Windom 2003 Consumer Confidence Report</b>
<b>Exhibit C</b>	<b>City of Windom Part I Wellhead Protection Plan</b>
<b>Exhibit D</b>	<b>MDH Second Scoping Letter, August 13, 2003</b>

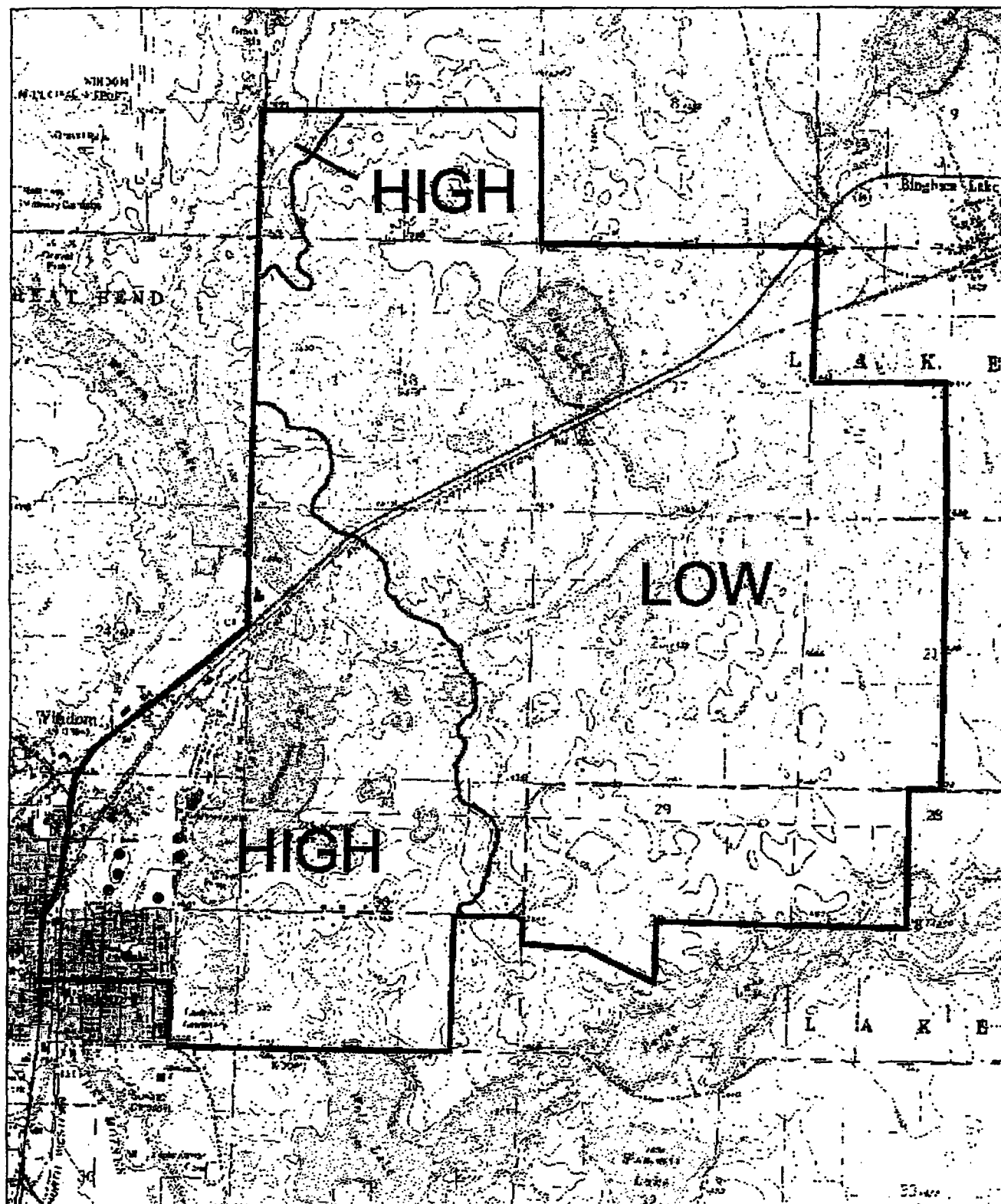
### **Abbreviations**

<b>BMP</b>	<b>Best Management Practice</b>
<b>DNR</b>	<b>Minnesota Department of Natural Resources</b>
<b>DWSMA</b>	<b>Drinking Water Supply Management Area</b>
<b>GPS</b>	<b>Global Positioning System</b>
<b>ISTS</b>	<b>Individual Septic Treatment System</b>
<b>LGU</b>	<b>Local Governmental Unit</b>
<b>MCL</b>	<b>Maximum Containment Level</b>
<b>MDH</b>	<b>Minnesota Department of Health</b>
<b>MPCA</b>	<b>Minnesota Pollution Control Agency</b>
<b>MRWA</b>	<b>Minnesota Rural Water Association</b>
<b>NRCS</b>	<b>National Resource Conservation Service</b>
<b>PCSI</b>	<b>Potential Contaminant Source Inventory</b>

<b>SWCD</b>	Soil and Water Conservation District
<b>SYSTEM</b>	WPWSS – Windom Well Field
<b>USGS</b>	Unites States Geological Services
<b>WHP</b>	Wellhead Protection
<b>WHPA</b>	Wellhead Protection Area
<b>WHPP</b>	Wellhead Protection Plan
<b>WPWSS</b>	Windom Public Water Supply System

**FIGURE #1**

**WELLHEAD PROTECTION AREA / DRINKING WATER  
SUPPLY MANAGEMENT AREA MAP**



City of Windom

Vulnerability of the Drinking Water Supply Management Area



**Wenck**

Wenck Associates, Inc.  
Environmental Engineers  
1800 Pioneer Creek Center  
Maple Plain, MN 55359

February 2003

Figure 7

**FIGURE #2**

**DRINKING WATER SUPPLY MANAGEMENT AREA  
SOIL MAP**

PRIMARY →

MGMT AREA

Join sheet 40

Join sheet 41

LOW ←

MGMT AREA

Wolf Lake

Sagehen Lake

## DRINKING WATER SUPPLY MANAGEMENT AREA

### High Permeability Soil Areas

**FIGURE #3**

**DRINKING WATER SUPPLY MANAGEMENT AREA  
FLOOD PLAIN MAP**



ZONE C

ZONE A

Creek

Perkins

7

ZONE A

COUNTY

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP

COUNTY OF  
**COTTONWOOD,**  
**MINNESOTA**  
(UNINCORPORATED AREAS)

PANEL 185 OF 225

COMMUNITY-PANEL NUMBER  
270622 0185 B

EFFECTIVE DATE:  
JANUARY 2, 1981

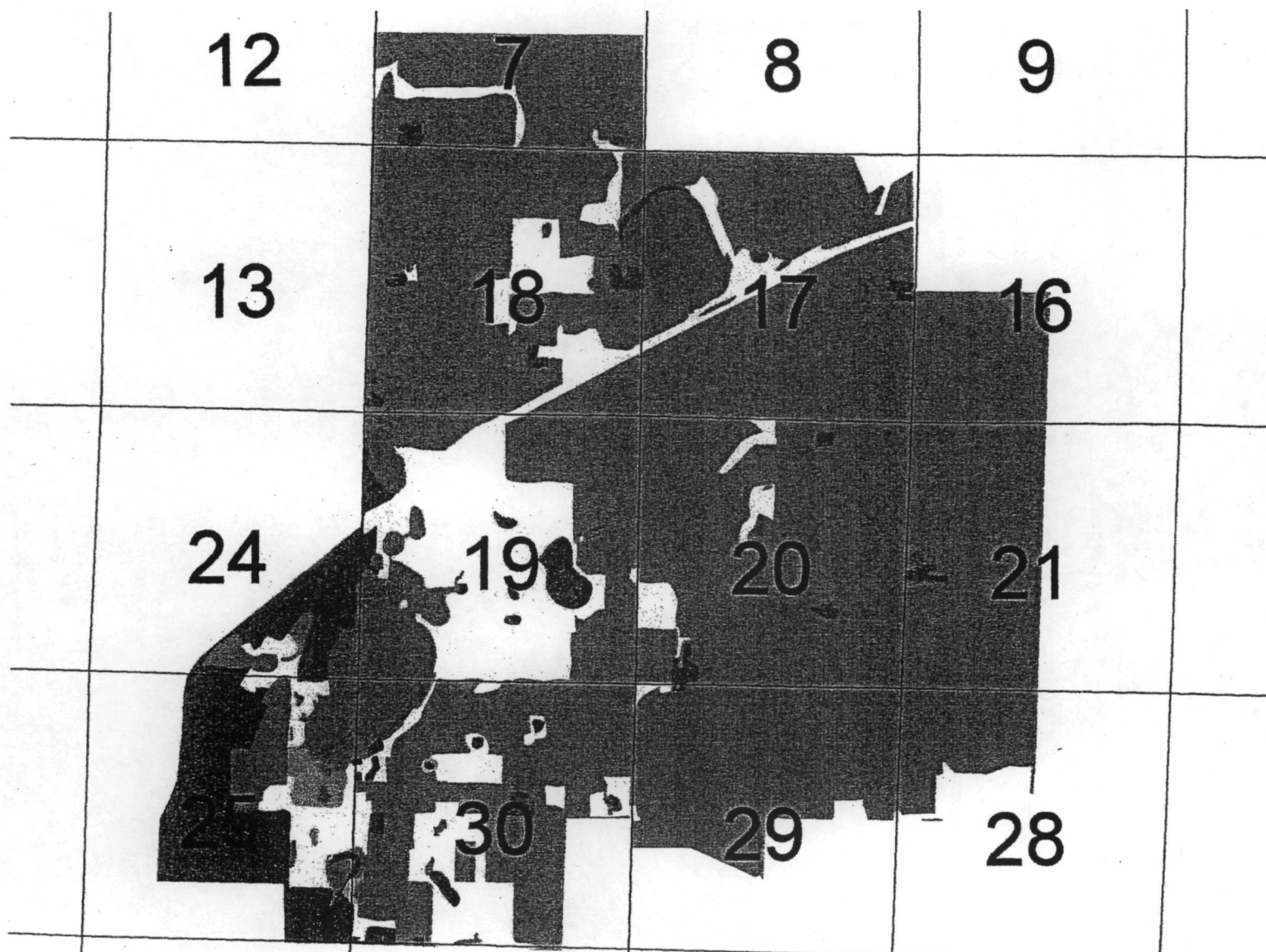


federal emergency management agency  
federal insurance administration

**FIGURE #4**

**DRINKING WATER SUPPLY MANAGEMENT AREA  
LAND USE MAP**



# City of Windom DWSMA Landuse and Township






1 0 1 2 Miles










## Township

-  Great Bend
-  Lakeside

## Landuse

-  Cultivated Land
-  Deciduous Forest
-  Farmsteads and Rural Residences

## Grassland

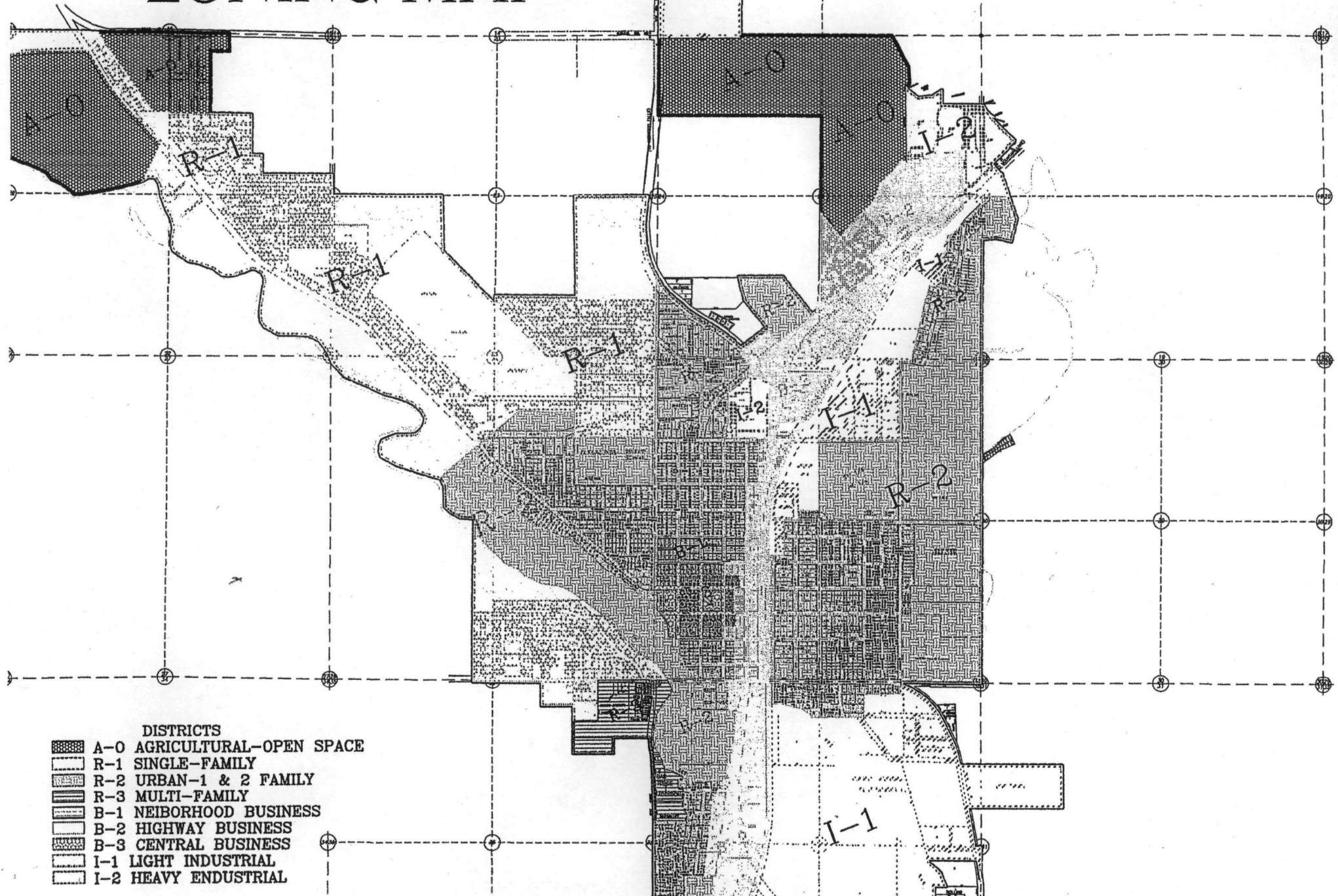
-  Grassland-Shrub-Tree (deciduous)
-  Gravel Pits and Open Mines
-  Other Rural Developments
-  Rural Residential Development Complex
-  Urban and Industrial
-  Water
-  Wetlands

Created By: K. Daberkow  
Cottonwood County  
January 2004

**FIGURE #5**

**CITY OF WINDOM  
ZONING MAP**

# CITY OF WINDOM ZONING MAP

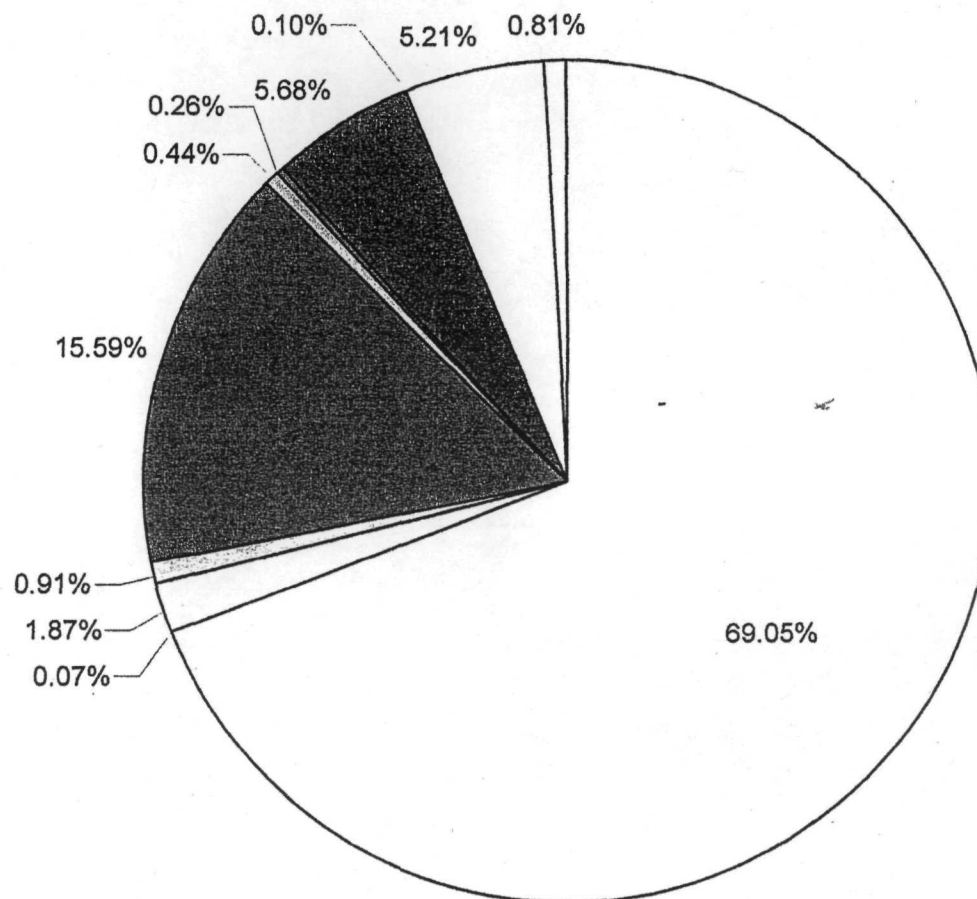


**FIGURE #6**

**DRINKING WATER SUPPLY MANAGEMENT AREA  
1990 LAND USE MAP**

## 1990 Landuse Classification

- ☐ Cultivated Land
- ☒ Grassland-Shrub-Tree (deciduous)
- ☐ Deciduous Forest
- ☐ Farmsteads and Rural Residences
- ☒ Grassland
- ☐ Gravel Pits and Open Mines
- ☒ Rural Residential Development Comp
- ☒ Urban and Industrial
- ☒ Other Rural Developments
- ☐ Water
- ☐ Wetlands



LANDUSE	High		Low		TOTAL	
	ACRES	SQ._MILES	ACRES	SQ._MILES	ACRES	SQ._MILES
Cultivated Land	520.25	0.81	2,955.05	4.62	3,475.30	5.43
Grassland-Shrub-Tree (deciduous)	3.59	0.01		0.00	3.59	0.01
Deciduous Forest	31.12	0.05	63.25	0.10	94.37	0.15
Farmsteads and Rural Residences	15.35	0.02	30.46	0.05	45.81	0.07
Grassland	460.11	0.72	324.71	0.51	784.82	1.23
Gravel Pits and Open Mines	22.18	0.03		0.00	22.18	0.03
Rural Residential Development Comp	13.14	0.02		0.00	13.14	0.02
Urban and Industrial	285.99	0.45		0.00	285.99	0.45
Other Rural Developments	1.29	0.00	3.75	0.01	5.04	0.01
Water	183.16	0.29	78.84	0.12	262.00	0.41
Wetlands	33.61	0.05	7.41	0.01	41.02	0.06
TOTAL	1569.79	2.45	3463.47	5.41	5033.26	7.86

**FIGURE #7**

**DRINKING WATER SUPPLY MANAGEMENT AREA  
CONSERVATION SET ASIDE ACRES**



# City of Windom DWSMA Conservation Set Aside Acres

## Set Aside Acres

in Low Vulnerability



in High Vulnerability



0.9

0

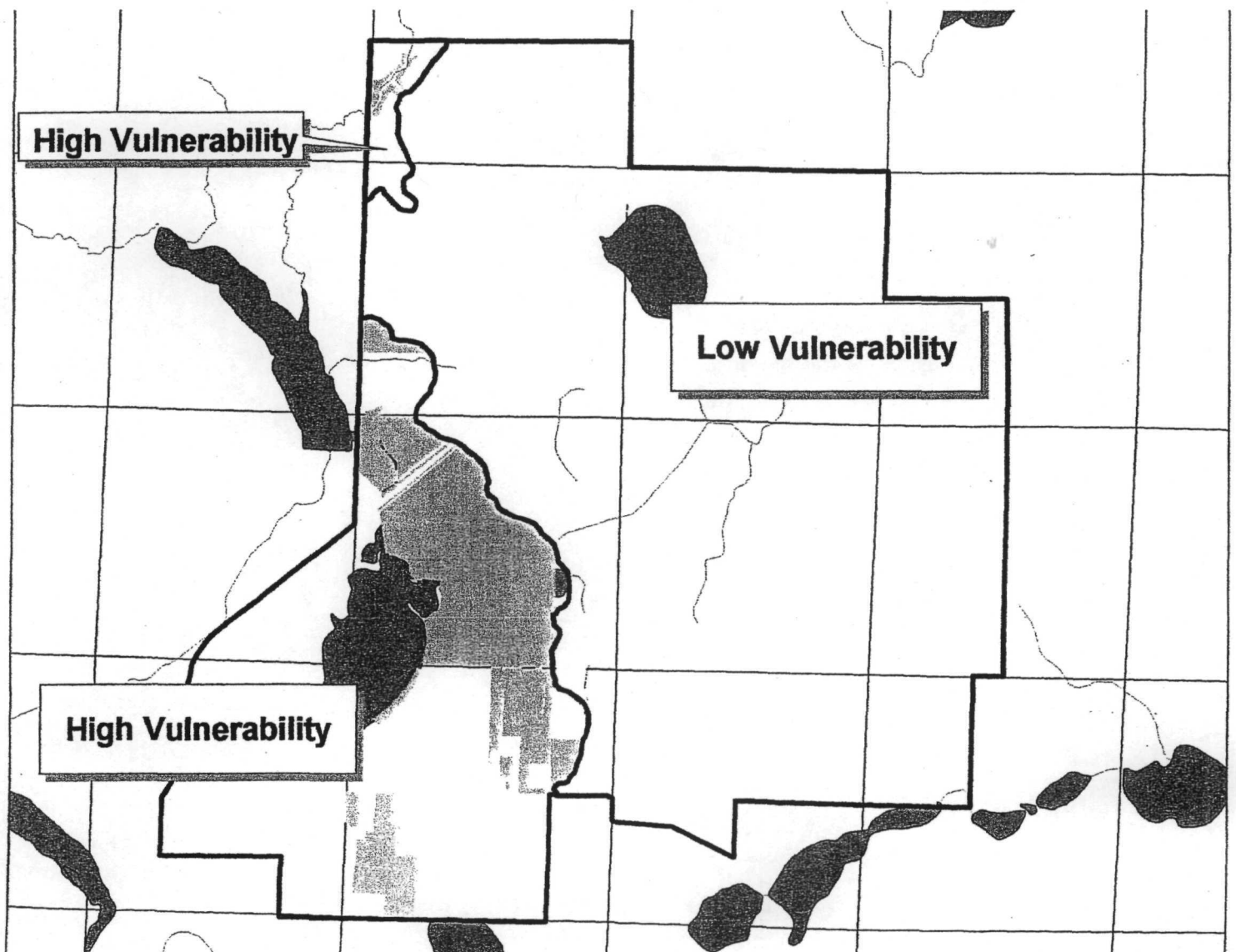
0.9 Miles

Created By: K. Daberkow  
Cottonwood County  
January 2004

High Vulnerability

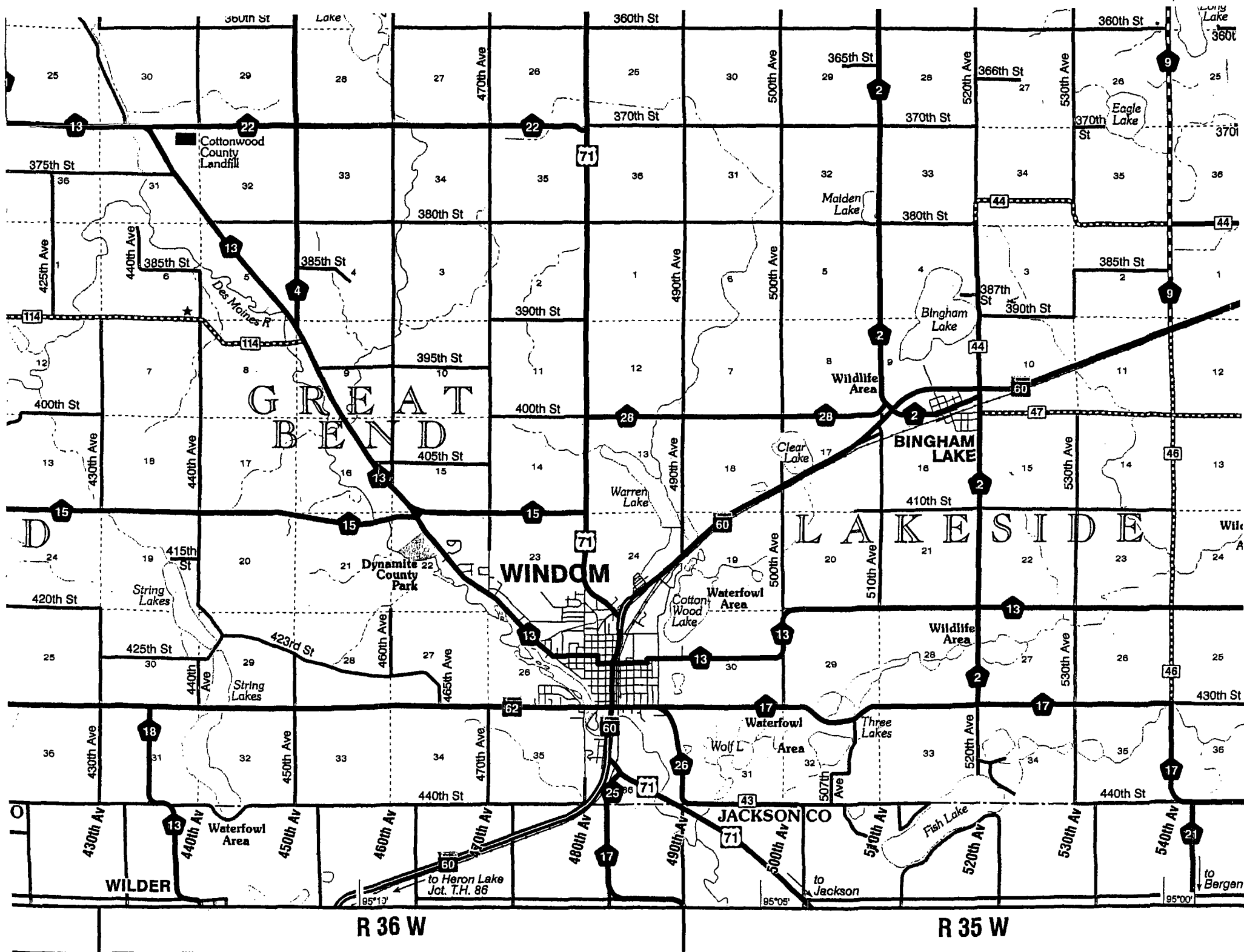
Low Vulnerability

High Vulnerability



**FIGURE #8**

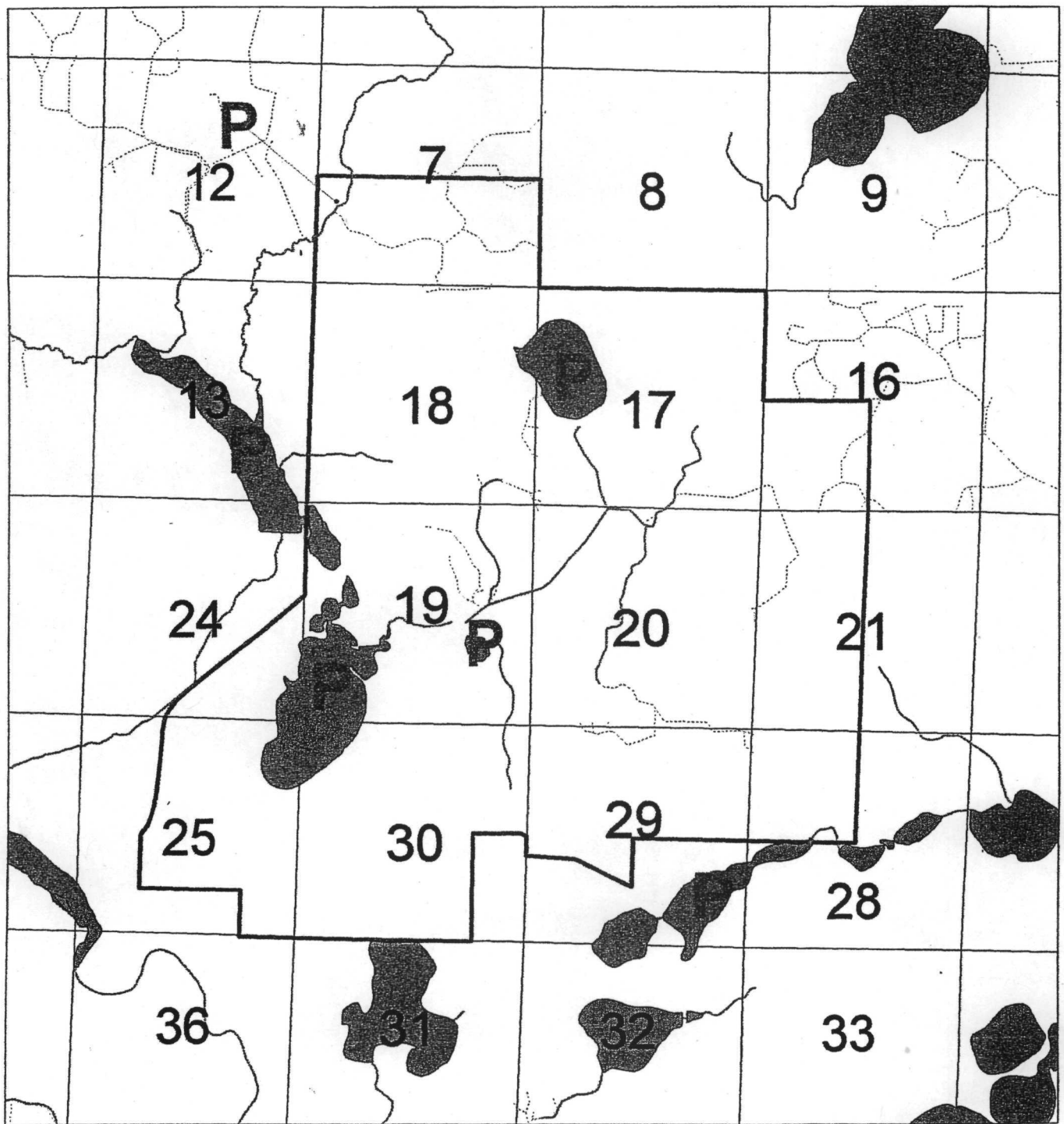
**DRINKING WATER SUPPLY MANAGEMENT AREA  
TRANSPORTATION CORRIDORS**



**FIGURE #9**

**WATERBODIES IN THE  
DRINKING WATER SUPPLY MANAGEMENT AREA**

# Waterbodies in the City of Windom Drinking Water DWSMA



**P-Protected  
DNR Waters**

**Township**



Great Bend

Lakeside



Lake



Stream



Ditch



**EXHIBIT #A**

**POTENTIAL CONTAINMENT SOURCE INVENTORY &  
MAPS**

## Guidance Document for "All Inventory" Table

<i>Column Headings</i>	<i>Description</i>
WWHPA	Well Unique ID used by WHPP team
TYPE	Abbreviated Listing (See list below)
NAME	Name of owner or business name
ADDRESS	Address
X_COORD	UTM Easting
Y_COORD	UTM Northing
PARCEL	Parcel number

<i>Type</i>	<i>Description</i>
AGCHEM	Agricultural chemical storage site
AGFEED	Agricultural feed storage site
AGUNK	Agricultural site unknown
FDLT	Permitted Feedlot
HWG	Hazardous waste generator
LUST	Leaking underground storage tank
RMP	Resource Management Plan
RST	Registered Storage Tank
SCH	School
SEP	Compliant Septic System
SVY	Salvage Yard
WELL	Well
WELLV	Class V well

WWHPA	TYPE	NAME	ADDRESS	X_COORD	Y_COORD	PARCEL
	AGCHEM	Prairie Land Coop	125th 16th St	330220.791	4859473.989	25.231.0050
	AGFEED	Peterson Feed Co	1293 Hale Place	330280.3748	4859521.789	25.131.0020
	AGUNK	A S A P				
	AGUNK	Schwalbach Hardware	193 9th St	330073.43	4859102.82	25.820.0070
	FDLT	CPM Farms, LLC	2425 Douglas Street			10.020.0100
	FDLT	Circle S Farms	52219 County Road 17			10.021.0101
	HWG	Windom Utility				
	HWG	Carls Repair	1271 Hale Place	330234.2812	4859380.51	25.821.0030
	HWG	Towlerton Motors	1815 1st Ave	330342.2904	4860416.64	25.164.0060
	HWG	Dynamic Sales Co Inc	955 1st Ave N	330129.2187	4859166.959	25.025.4100, .2800
	HWG	Lunds Body Shop	177 12th St	330131.0597	4859469.253	25.821.0080
	HWG	Windom Painting	1185 1st Ave N	330137.4713	4859457.913	25.025.4800
	HWG	Schwalbach Hardware	193 9th St			25.820.0070
	HWG	Windom Ready Mix	1405 Cottonwood Lake Dr			25.025.0200
	HWG	State Special Waste Facility				
	RMP	Caldwells	2850 Highway 60			25.159.0010, .0011
	RST	Home For Creative Living	108 9th St	330405.7141	4859107.127	25.672.0090
	RST	Highland School	72 10th St	330554.9366	4859238.006	25.352.0140
	RST	City Of Windom/Electric Plant	1105 - 1st Ave	330147.6081	4859361.469	25.820.0100
	RST	Staples Oil Co Inc	1055 1st Ave	330144.5566	4859293.416	25.025.3200
	RST	Windom Ready Mix	1405 Cottonwood Lake Dr			25.025.0200
	RST	Steffens/Towlerton	1815 1st Ave			25.164.0060
	RST	Windom Rdo #18715				
	SCH	Highland School		330564.8013	4859220.316	25.352.0140
	SEP	Gary Mastin	40492 490th Avenue			10.018.0200
	SEP	Carl Nehlsen	40918 490th Avenue			10.018.0301
	SEP	Tim Ketzenberg	50360 Co. Rd. 13			10.020.0300
	SEP	Doug Schroeder				10.030.0201
	SEP	Jon Christenson	49286 Co. Rd. 13			10.030.0304
	SEP	Rita Sell	49362 Co. Rd. 13			10.030.0305
	SEP	Frank Hayek	42478 490th Avenue			10.030.0501
	SEP	Jeff Johnson	49043 Co. Rd. 13			10.030.0602
	SEP	Mark Lillegaard	49229 Co. Rd. 13			10.030.0606
	SEP	Glen Olson				10.030.0608

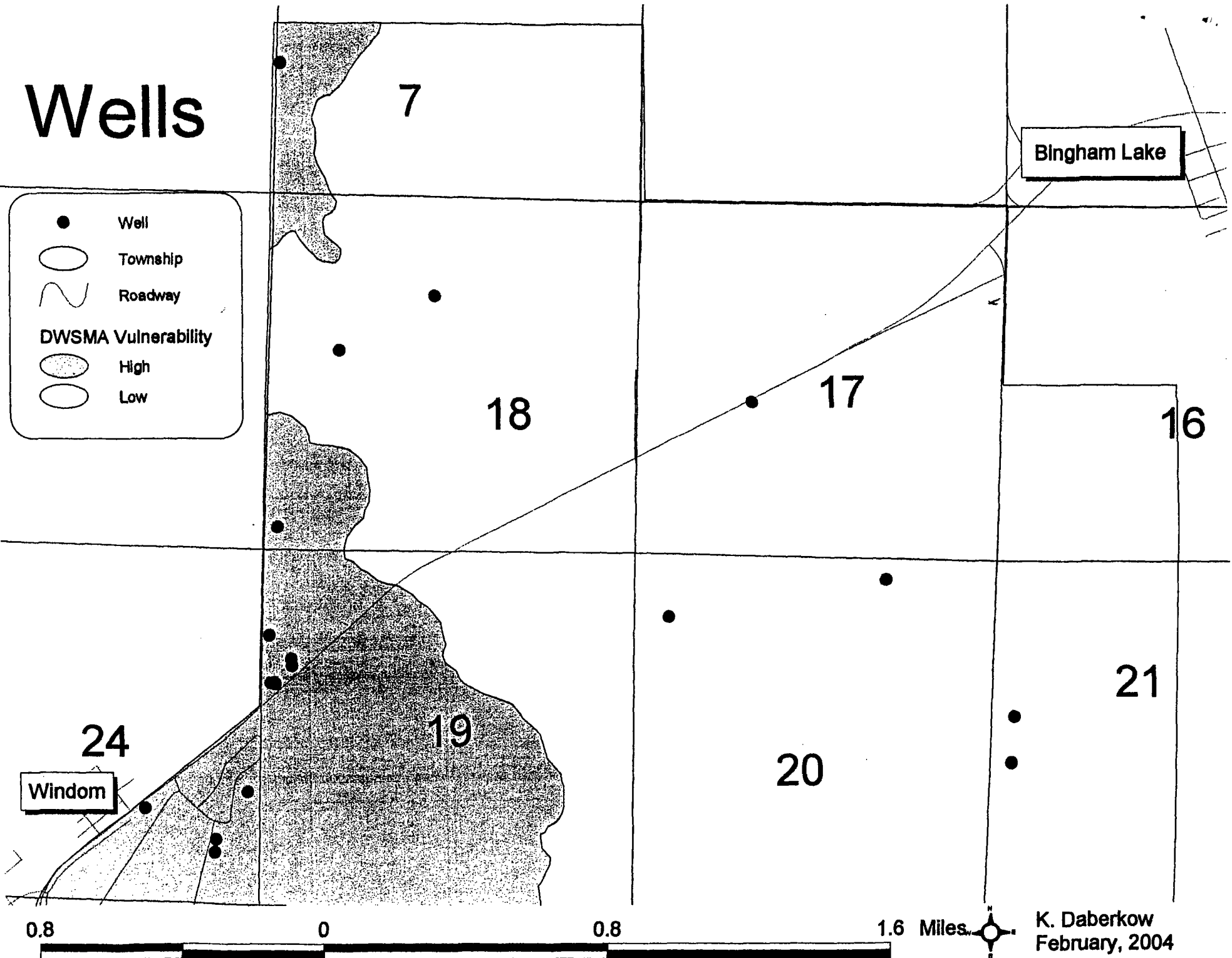
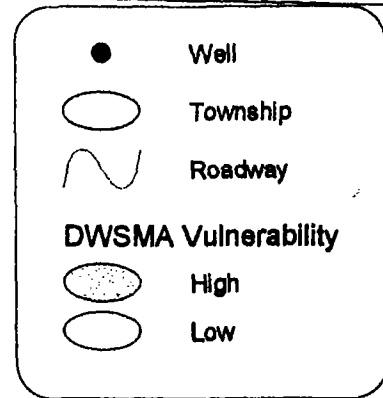


WWHPA	TYPE	NAME	ADDRESS	X_COORD	Y_COORD	PARCEL
	SEP	William Liftin	49228 Co. Rd. 13			10.030.0617
	SEP	Doug Woizeschke	49289 Co. Rd. 13			10.030.0702
	SEP	David Murphy	49303 Co. Rd. 13			10.030.0704
	SEP	Natalie Bretzman				10.030.0705
	SEP	Gene Peterson				10.030.0708
	SEP	Kevin Gotto				10.030.0709
	SEP	Larry Smith	49667 Co. Rd. 13			10.030.0801
	SEP	Floyd Axford	49616 Highway 60			10.960.0010
	SVY	Windom Wrecking	2603 Highway 60			25.024.0760, .0740
1	WELL			332081.00	4859505.00	10-030-0201
35	WELL	City of Windom		330745.29	4859597.10	25-025-0500
2	WELL			331962.00	4859009.00	
3	WELL			333507.00	4862603.00	
36	WELL			330940.00	4860241.00	25-025-0500
37	WELL			330870.00	4860303.00	25-025-0500
38	WELL	City of Windom		330938.65	4860156.20	25-025-0500
39	WELL	Caldwell Packing Production Well		331338.00	4861333.00	25-159-0010
40	WELL	Caldwell Packing Production Well		331418.84	4861410.66	25-159-0010
41	WELL	Caldwell Packing Production Well		331321.00	4861331.00	25-159-0010
42	WELL	City of Windom		330871.94	4859843.40	25-025-0500
43	WELL	City of Windom		330872.91	4859974.67	25-025-0500
44	WELL			330931.00	4860125.00	25-025-0500
45	WELL			330938.66	4860156.10	25-025-0500
46	WELL	City of Windom		330962.47	4860179.99	25-025-0500
89	WELL					
47	WELL	Caldwell Packing		331317.42	4861548.46	25-159-0010
48	WELL	Caldwell Packing		331341.89	4861325.67	25-159-0010
4	WELL			334687.00	4861168.00	10-021-0101
5	WELL	Windom City Landfill		331023.59	4859398.76	25-025-0400
6	WELL	Windom City Landfill		331304.12	4859311.87	10-030-0601
7	WELL	Windom City Landfill		331041.01	4859550.65	25-025-0400
8	WELL	Windom City Landfill		330902.31	4859500.97	25-025-0400
9	WELL	Windom City Landfill		330899.79	4859394.20	25-025-0400
10	WELL	Windom City Landfill		331080.30	4859520.18	25-025-0400

WWHPA	TYPE	NAME	ADDRESS	X_COORD	Y_COORD	PARCEL
11	WELL	Windom City Landfill		331081.52	4859519.11	25-025-0400
12	WELL	Windom City Landfill		330904.48	4859499.31	25-025-0400
13	WELL	Windom City Landfill		330901.91	4859505.88	25-025-0400
14	WELL	Windom City Landfill		330901.60	4859392.92	25-025-0400
15	WELL	Windom City Landfill		330902.96	4859393.28	25-025-0400
16	WELL	Windom City Landfill		331304.72	4859307.65	10-030-060
17	WELL	Windom (well field test holes)		330500.08	4859858.92	25-025-0500
18	WELL	Windom (well field test holes)		330516.27	4859859.15	25-025-0500
19	WELL	Windom (well field test holes)		330495.50	4859735.95	25-025-0500
20	WELL	Windom (well field test holes)		330434.96	4859625.62	25-025-0500
21	WELL	City of Windom		330493.89	4859826.81	25-025-0500
22	WELL	Windom (well field test holes)		330486.94	4859826.27	25-025-0500
23	WELL	Windom (well field test holes)		330458.41	4859825.68	25-025-0500
24	WELL	Windom (well field test holes)		330518.50	4859824.45	25-025-0500
25	WELL			330468.00	4861153.00	
26	WELL			330468.00	4861153.00	25-831-0070
27	WELL			330422.00	4859547.00	
28	WELL			330468.00	4861153.00	25-831-0170
29	WELL			331640.00	4862839.00	10-018-0200
30	WELL			330468.00	4861153.00	
31	WELL	Windom City Landfill		331018.00	4859226.00	25-025-0400
32	WELL	Windom City Landfill		331019.77	4859446.73	25-025-0400
49	WELL	Windom City Landfill		331120.09	4859519.13	25-025-0400
50	WELL	City of Windom		330499.48	4859744.52	25-025-0500
33	WELL	Windom City Landfill		330901.39	4859483.54	25-025-0400
51	WELL	American Lutheran Church	9th & Prospect	330427.20	4859105.07	25-821-0870
52	WELL	Windom Municipal Power Plant		330082.58	4859393.65	25-820-0100
53	WELL	Windom Municipal Power Plant		330067.22	4859401.07	25-820-0100
54	WELL	Windom Municipal Power Plant		330092.16	4859409.82	25-820-0100
55	WELL	City of Windom		330513.80	4859853.05	25-025-0500
34	WELL			330517.00	4859841.00	25-025-0500
56	WELL	City of Windom		330443.86	4859637.99	25-025-0500
57	WELL	Project well		330435.35	4859553.97	25-025-0500
58	WELL	Project well		330632.75	4859774.94	25-025-0500

WWHPA	TYPE	NAME	ADDRESS	X_COORD	Y_COORD	PARCEL
59	WELL	Project well		330939.96	4859944.45	25-025-0500
60	WELL	Project well		332187.52	4858719.81	
61	WELL	Project well		332448.58	4859547.71	
90	WELL					
79	WELL			331355.00	4862035.00	10-018-0301
80	WELL			334112.00	4861789.00	10-020-0100
81	WELL			334673.00	4860958.00	10-021-0100
82	WELL			331797.00	4859429.00	
83	WELL			331416.00	4861440.00	25-159-0010
84	WELL			331720.00	4859437.00	
85	WELL			331705.00	4859465.00	
86	WELL			331667.00	4859470.00	
87	WELL			331983.00	4859558.00	
88	WELL			331885.00	4859479.00	
62	WELL	Adolphson Study		331383.94	4864134.81	
63	WELL			330947.00	4860229.00	25-025-0500
64	WELL			330919.58	4860041.24	25-025-0500
65	WELL			330851.22	4860151.94	25-025-0500
66	WELL			330117.53	4859355.50	25-025-4001
67	WELL			330117.53	4859355.50	25-025-4001
68	WELL			330117.53	4859355.50	25-025-4001
69	WELL	well beneath windmill?dry		333126.58	4861625.39	10-020-0300
70	WELL	City of Windom		330553.91	4859841.69	25-025-0500
71	WELL	City of Windom		330589.39	4859838.90	25-025-0500
72	WELL	City of Windom		330588.63	4859808.28	25-025-0500
73	WELL	City of Windom		330519.16	4859873.50	25-025-0500
74	WELL	Windom City Land Fill		331018.34	4859226.11	25-025-0400
75	WELL	Windom City Land Fill		331108.63	4859305.28	25-025-0400
76	WELL	Windom City Land Fill		331018.47	4859397.16	25-025-0400
77	WELL	Windom City Land Fill		330994.26	4859511.65	25-025-0400
78	WELL	Windom City Land Fill		331223.12	4859518.09	25-025-0400
	WELLV	Dick's Welding				25-231-0040
	WELLV	Windom ready Mix				25-025-0200

# Wells



# Wells Section 30 Lakeside Township

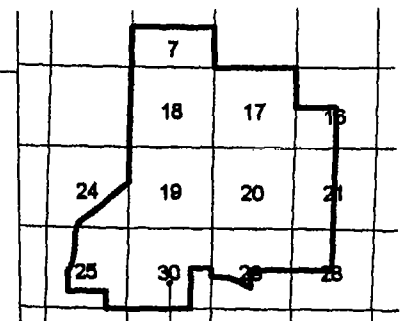
- Well
- Roadway

DWSMA Vulnerability

- High
- Low

13

17



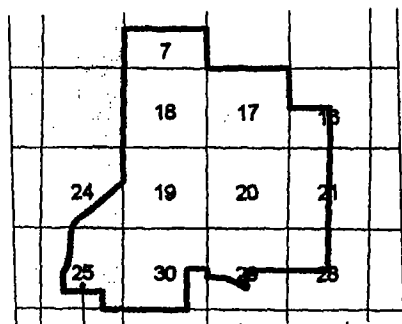
Area of Detail

K. Daberkow  
February, 2004

0.4 0 0.4 Miles



**Wells  
Section 25  
Great Bend Township**



Area of Detail

**Windom**

US 71/60

13



0.3

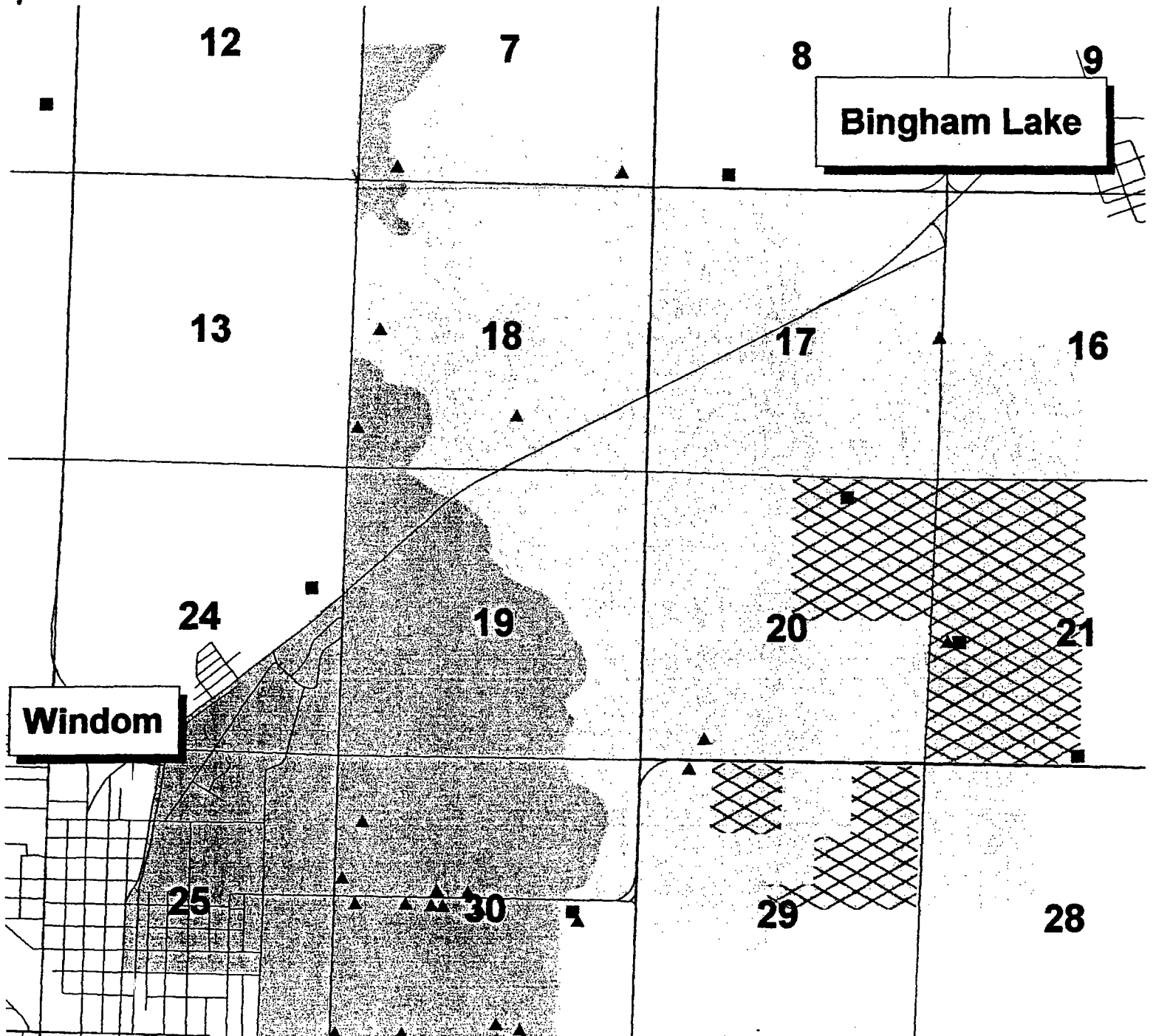
0

0.3

0.6 Miles

K. Daberkow  
February, 2004

# Septics, Feedlots, & Manure Acres



Septic Compliant

- ▲ NO
- ▲ YES

DWSMA Vulnerability

- High
- Low



Registered Feedlot



Manure Acres



Created by  
K. Daberkow,  
February 2004

1

0

1

2 Miles

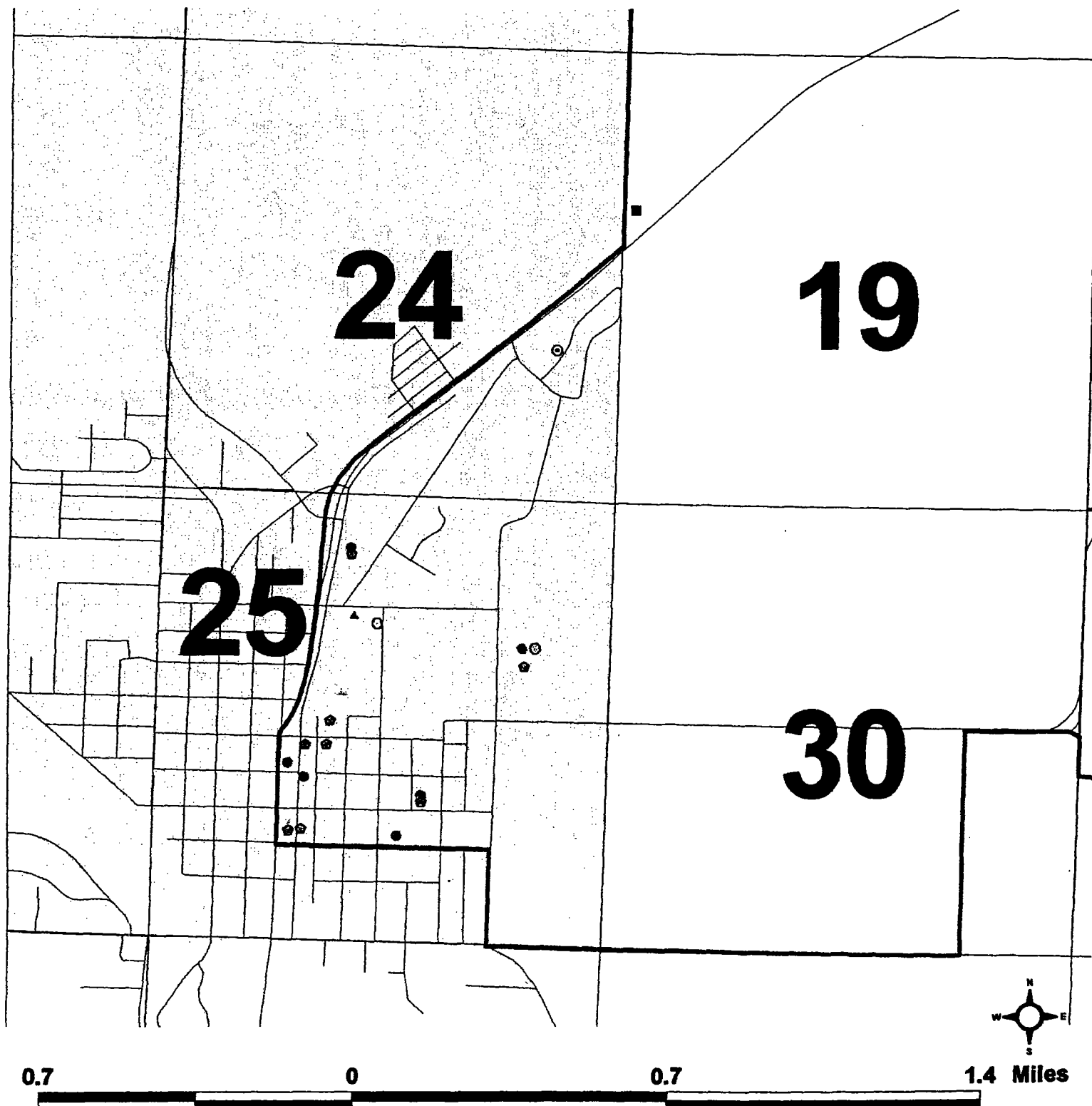
# Source Inventory and Class V Wells

## Source Inventory

- ▲ Agricultural chemical storage site
- △ Agricultural feed storage site
- △ Agricultural site unknown

- ◆ Hazardous waste generator
- Registered Storage Tank
- Resource Management Plan
- ⊙ Salvage Yard

- ★ School
- ⊙ Class V Well





**EXHIBIT #B**

**CITY OF WINDOM CONSUMER CONFIDENCE REPORT**

The City of Windom is issuing the results of monitoring done on its drinking water for the period from January 1 to December 31, 2003. The purpose of this report is to advance consumers' understanding of drinking water and heighten awareness of the need to protect precious water resources.

### Source of Water

The City of Windom provides drinking water to its residents from a groundwater source: eight wells ranging from 87 to 142 feet deep, that draw water from the Quaternary Buried Artesian aquifer and the Quaternary Water Table aquifer.

The Minnesota Department of Health has determined that one or more sources of your drinking water is susceptible to contamination. If you wish to obtain the entire source water assessment regarding your drinking water, please call 651-215-0800 or 1-800-818-9318 (and press 5) during normal business hours. Also, you can view it on line at [www.health.state.mn.us/divs/eh/water/swp/swa](http://www.health.state.mn.us/divs/eh/water/swp/swa).

Call **507-831-8138** if you have questions about the City of Windom drinking water or would like information about opportunities for public participation in decisions that may affect the quality of the water.

### Results of Monitoring

No contaminants were detected at levels that violated federal drinking water standards. However, some contaminants were detected in trace amounts that were below legal limits. The table that follows shows the contaminants that were detected in trace amounts last year. (Some contaminants are sampled less frequently than once a year; as a result, not all contaminants were sampled for in 2003. If any of these contaminants were detected the last time they were sampled for, they are included in the table along with the date that the detection occurred.)

#### Key to abbreviations:

**MCLG**—Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**MCL**—Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**AL**—Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirement which a water system must follow.

**90th Percentile Level**—This is the value obtained after disregarding 10 percent of the samples taken that had the highest levels. (For example, in a situation in which 10 samples were taken, the 90th percentile level is determined by disregarding the highest result, which represents 10 percent of the samples.) Note: In situations in which only 5 samples are taken, the average of the two with the highest levels is taken to determine the 90th percentile level.

**pCi/l**—PicoCuries per liter (a measure of radioactivity).

**ppb**—Parts per billion, which can also be expressed as micrograms per liter (ug/l).

ppm—Parts per million, which can also be expressed as milligrams per liter (mg/l).

N/A—Not Applicable (does not apply).

Contaminant (units)	MCLG	MCL	Level Found		Typical Source of Contaminant
			Range (2003)	Average /Result*	
Alpha Emitters (pCi/l) (05/15/2002)	0	15.4	N/A	0.58	Erosion of natural deposits.
Fluoride (ppm)	4.0	4.0	0.55- 1.1	1.05	State of Minnesota requires all municipal water systems to add fluoride to the drinking water to promote strong teeth; Erosion of natural deposits; Discharge from fertilizer and aluminum factories.
Haloacetic Acids (HAA5) (ppb)	N/A	60.0	N/A	9.2	By-product of drinking water disinfection.
Nitrate (as Nitrogen) (ppm)	10.0	10.0	N/A	1.3	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.
TTHM (Total trihalomethanes) (ppb)	N/A	100.0	N/A	30.6	By-product of drinking water disinfection.

Contaminant (units)	Level Found		Typical Source of Contaminant
	Range (2003)	Average/ Result*	
Radon (pCi/l) (10/17/2001)	N/A	20.0	Erosion of natural deposits.

\*This is the value used to determine compliance with federal standards. It sometimes is the highest value detected and sometimes is an average of all the detected values. If it is an average, it may contain sampling results from the previous year.

Radon is a radioactive gas which is naturally occurring in some groundwater. It poses a lung cancer risk when gas is released from water into air (as occurs during showering, bathing, or washing dishes or clothes) and a stomach cancer risk when it is ingested. Because radon in indoor air poses a much greater health risk than radon in drinking water, an Alternative Maximum Contaminant Level (AMCL) of 4,000 picoCuries per liter may apply in states that have adopted an Indoor Air Program, which compels citizens, homeowners, schools, and communities to reduce the radon threat from indoor air. For states without such a program, the Maximum Contaminant Level (MCL) of 300 pCi/l may apply. Minnesota plans to adopt an Indoor Air Program once the Radon Rule is finalized.

Contaminant (units)	MCLG	AL	90% Level	# sites over AL	Typical Source of Contaminant
Copper (ppm) (06/19/2002)	N/A	1.3	1.33	2 out of 20	Corrosion of household plumbing systems; Erosion of natural deposits.

Some contaminants do not have Maximum Contaminant Levels established for them. These “unregulated contaminants” are assessed using state standards known as health risk limits to determine if they pose a threat to human health. If unacceptable levels of an unregulated contaminant are found, the response is the same as if an MCL has been exceeded; the water system must inform its customers and take other corrective actions. In the table that follows are the unregulated contaminants that were detected:

Contaminant (units)	Level Found		Typical Source of Contaminant
	Range (2003)	Average/Result	
Sodium (ppm) (05/04/1999)	N/A	8.6	Erosion of natural deposits.
Sulfate (ppm) (05/04/1999)	N/A	77.0	Erosion of natural deposits.

### Compliance with National Primary Drinking Water Regulations

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

*Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

*Inorganic contaminants*, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

*Pesticides and herbicides*, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

*Organic chemical contaminants*, including synthetic and volatile organic chemicals, which are

by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.

*Radioactive contaminants*, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the U. S. Environmental Protection Agency (EPA) prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 800-426-4791.

*Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium are available from the Safe Drinking Water Hotline at 800-426-4791.*

**EXHIBIT #C**

**CITY OF WINDOM PART I WELLHEAD PROTECTION  
PLAN**

# City of Windom Part I Wellhead Protection Plan

**Wenck File #0045-05**

Prepared for:

**CITY OF WINDOM**  
444 - 9th Street  
Windom, Minnesota 56101

Prepared by:

**WENCK ASSOCIATES, INC.**  
1800 Pioneer Creek Center  
P.O. Box 249  
Maple Plain, Minnesota 55359-0249  
(763) 479-4200

February 2003



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<b>4.0</b>	<b>REFERENCES</b>	<b>4-1</b>

### **FIGURES**

- 1 Wellhead Protection Area and Drinking Water Supply Management Area
- 2 Cross-Section Location Map
- 3 Cross-Section A-A'
- 4 Cross-Section B-B'
- 5 10-Year Groundwater Capture Area and Contributing Surface Water Features
- 6 DNR Vulnerability Ratings taken from County Soil Survey
- 7 Vulnerability of DWSMA



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### APPENDICES

- A Well Logs
- B Model Input and Output Files (Prints and Electronic Files)
- C MDH Well Vulnerability Assessment Printouts

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## **1.0 Introduction**

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This report documents the delineation of the wellhead protection area (WHPA), vulnerability assessment, and criteria for delineating the drinking water supply management area (DWSMA). The delineation was performed in accordance with rules for preparing and implementing wellhead protection measured for public water supply wells that were prepared by the Minnesota Department of Health (MDH) (MR4720.5100 to 4720.5580).

The results were a cooperative effort between Bruce Olsen (MDH), City staff, and the City's consulting firm of Wenck Associates, Incorporated (Wenck).

The WHPA was determined by using the analytical element model MLAEM (version 5.02). The DWSMA incorporates all properties that were partially or completely within the WHPA. Figure 1 shows the boundaries of the WHPAs and the DWSMA.

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## **2.0 Hydrogeologic Setting and Wellhead Protection Area Delineation**

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This section documents the delineation of the wellhead protection area (WHPA) for the City of Windom, Minnesota. Figure 2 shows the active municipal wells (City Wells 3, 4, 5, 6, 8, 9 and 10). City Well 7 is used as an emergency backup well. The WHPA was determined in accordance with Minnesota Rules, Parts 4720.5100 to 4720.5590, regarding WHP measures for public water supply wells.

### **2.1 HYDROGEOLOGIC SETTING**

The primary sources used herein for hydrogeologic information are: 1) geologic cross-sections constructed based on boring logs for city wells and nearby geologic logs, 2) geologic cross-sections obtained from the U.S. Geological Survey through personal contacts with Mr. Tim Cowdery, and 3) Water Resources of the Des Moines River Watershed, Southwestern Minnesota, U.S. Geological Survey, Hydrologic Investigations Atlas HA-553, H.W. Anderson, Jr. et al., 1976.

#### **2.1.1 Regional Hydrogeology**

According to Anderson et al. (1976), the uppermost bedrock in the region near Windom is Cretaceous shale and siltstone (with some sandstone), directly overlying the Sioux Quartzite, which is of Precambrian age. The bedrock in this region is generally not the preferred aquifer because water-yielding units are localized and produce only moderate supplies. The top of the bedrock generally occurs at elevation 1,000 feet (NGVD) near Windom. The thickness of overlying glacial deposits ranges from about 200 to 400 feet in the Windom vicinity.

The major regional aquifer occurs in the glacial drift. Anderson et al. (1976) and Adolphson (1983) identify a glacial outwash aquifer that runs beneath Windom along the Des Moines River corridor, and regionally discharges to the Des Moines River. U.S. Geological Survey investigators have recently observed that the outwash within and in the immediate vicinity of Windom's municipal wellfield is distinctly "cleaner" (freer of fine sediments) than other parts of the regional aquifer (Tim Cowdery, personal communication, February 27, 2001). Anderson et al. (1976) show the aquifer surrounded laterally in the Windom area by the Altamont end moraine, which is mostly silty, calcareous till.

Kanivetsky (1979) estimates groundwater recharge due to direct infiltration from rainfall in the Windom area to be between 0.5 and 1.9 inches. Recharge from lakes is estimated from runoff estimates to be between 2 and 6 inches per year (Kanivetsky, 1979). According to Anderson et al. (1976), discharge along reaches of the Des Moines River (i.e., groundwater seepage into the river) is estimated to average between 0.4 and 0.7 cubic feet per second (cfs) per mile.

### **2.1.2 Local Hydrogeology**

Glacial outwash (predominately sand and gravel) ranges in thickness to greater than 100 feet in the Windom municipal wellfield. This unconfined aquifer is bounded below by thick (greater than 100 feet) clay, and on the sides by glacial till which forms the buried valley walls (see Figures 2 – 4).

The glacial outwash aquifer is recharged via infiltrating rainfall, interaction with surface water features, and flow from the surrounding till. Of particular significance to groundwater levels and flow direction near the City's wellfield are Cottonwood Lake, Warren Lake, the Des Moines River, and other surface water features. In the wellfield vicinity, the elevation of the base of the aquifer is approximately 1,270 feet (NGVD), and the saturated thickness is about 50 to 70 feet.

The hydraulic conductivity and transmissivities for the aquifer in the main wellfield vicinity (cleaner outwash) were estimated by pumping tests. The following table lists the different pumping tests and typical results for each:

Test Conducted By, Date	Well	Transmissivity (ft <sup>2</sup> /day)	Saturated Thickness (ft)	Hydraulic Conductivity (ft/day)
Bonestroo, 1974	CW-6	23,000	80	290
Wenck, 1989	RW-A	19,000	85	220
Liesch, 1990	Test Well	18,000	62	290
Wenck, 1997	CW-9	1,500	50	30*
Wenck, 1998	CW-10	25,000	82	310

*\*Wenck (1997) attributed the low hydraulic conductivity observed at CW9 to inadequate development of the well.*

Wenck (1997) estimated the hydraulic conductivity for the aquifer in the main wellfield vicinity to be 205 ft/day based on the above-listed hydraulic conductivities and through the calibration of a groundwater model requested by the Minnesota Department of Natural Resources (MDNR). Based on an average saturated thickness in the main wellfield vicinity of 70 ft, the aquifer transmissivity is taken to be 14,350 ft<sup>2</sup>/day.

Based on the U.S. Geological Survey (Tim Cowdery, personal communication, February 27, 2001), the hydraulic conductivity of the aquifer outside the main wellfield vicinity is lower than that within the main wellfield since the outwash in the immediate vicinity of the wellfield is distinctly "cleaner."

## 2.2 CITY WATER SUPPLY

Windom obtains its water supply from seven wells (City Wells 3, 4, 5, 6, 8, 9 and 10) as shown on Figure 2. The City has one additional well (City Well 7) designated for backup use only.

**Below is a summary of the City's annual water use in gallons for the years 1996-2000:**

Well Number	1996	1997	1998	1999	2000	Five-Year Maximum
CW3	30,657,200	31,880,800	40,859,500	22,669,300	33,771,300	40,859,500
CW4	34,169,300	45,545,200	38,010,000	23,410,900	29,504,500	45,545,200
CW5	32,842,900	37,982,900	33,132,700	16,727,100	27,534,800	37,982,900
CW6	33,785,800	54,280,000	39,241,100	34,423,900	39,926,800	54,280,000
CW8	80,588,100	83,778,900	69,255,800	65,201,000	65,518,900	83,778,900
CW9	—	—	11,747,800	21,334,900	25,665,200	25,665,200
CW10	—	—	46,734,200	118,833,400	119,149,600	119,149,600
<b>Total</b>	<b>212,043,300</b>	<b>253,467,800</b>	<b>278,981,100</b>	<b>302,600,500</b>	<b>341,071,100</b>	<b>407,261,100</b>

The City is currently permitted with the MDNR to pump 420,000,000 gallons. The projected water use takes into account population growth, an arrangement to supply water to the Red Rock Rural Water System, and the addition of the new corn processing plant in Bingham Lake.

## 2.3 CRITERIA USED TO DELINEATE THE WHPA

### 2.3.1 Daily Volume of Water Pumped

For purposes of WHPA delineation, the projected annual water use is used in the groundwater model, except for CW3, CW4, CW5, and CW6, where the five-year maximum water use was used because it was higher than the projected water use. The following table lists the projected and modeled annual flows in gallons:

Well Number	Projected Annual Flows	Modeled Flows
CW3	40,000,000	40,859,500
CW4	30,000,000	45,545,200
CW5	30,000,000	37,982,900
CW6	40,000,000	54,280,000
CW8	100,000,000	100,000,000
CW9	40,000,000	40,000,000
CW10	140,000,000	140,000,000
<b>Total</b>	<b>420,000,000</b>	<b>458,667,600</b>

### **2.3.2 Aquifer Transmissivity**

The aquifer hydraulic conductivity is taken to be 205 ft/day in the main wellfield vicinity. Based on an average aquifer saturated thickness of 70 ft, the aquifer transmissivity is 14,350 ft<sup>2</sup>/day.

### **2.3.3 Groundwater Flow Field**

The groundwater flow field is primarily driven by areal recharge, discharge via municipal wells, and discharge to the Des Moines River. As shown on Figure B-2, the groundwater flows from the north/northeast toward the Des Moines River in the vicinity of the City of Windom. The average groundwater hydraulic gradient ranges from 0.0015 to 0.003 ft/ft as shown on Figure B-2.

### **2.3.4 Flow Boundaries**

The aquifer lateral flow boundaries (extent of aquifer) are based on the glacial deposit map obtained from Anderson et al. (1976) and modified after discussions with Tim Cowdery with the U.S. Geological Survey. Vertically, the aquifer is underlain by more than 100 feet of clay.

The bed resistance for Cottonwood Lake, Warren Lake, Wolf Lake, and the Cemetery Pond was based on Wenck (1997). Wenck (1997) documents the incorporation of comments from the Minnesota Department of Health, the Minnesota Pollution Control Agency, and the Minnesota Department of Natural Resources into the groundwater flow model published by Wenck (1996). Figures 2 and 3 show the aquifer and the underlying clay formations.

### **2.3.5 Time of Travel**

The WHPA corresponds to the 10-year capture zone of the municipal wells, based on the modeled flows shown in Section 2.3.1.

## **2.4 WELLHEAD PROTECTION AREA DELINEATION**

### **2.4.1 Groundwater Model**

The wellhead protection area for Windom was delineated using the MLAEM model (Version 5.02). MLAEM is based on the analytic element method, which is a technique for modeling groundwater flow in two and three dimensions. It is particularly suitable for modeling flow in large domains, and was originally developed for two-dimensional modeling of regional groundwater flow.

The MLAEM model allows for the specification of uniform background flow, pumping wells, and uniform recharge, which could represent infiltration due to rainfall. It also allows the specification of linesinks, which can be used to represent streams that interact with an aquifer.

### **2.4.2 Model Inputs**

The model was based on a site-specific coordinate system where MW-7 represents the origin (coordinates: 0,0). The model was set up to include the City of Windom water supply wells. The extent of the unconfined aquifer was based on the geological cross-sections (Figures 3 and 4) and maps supplied by the USGS (Tim Cowdery, Personal Communications, 2001).

The MLAEM inputs include the following aquifer and flow field specifications:

- Base elevation 1270 ft NGVD
- Hydraulic conductivity 205 ft/day
- Porosity 0.25
- Total infiltration (uniform recharge) of 1.9 inches/year or  $4.4 \times 10^{-4}$  ft/day
- Reference Point Coordinates:  $-1.652 \times 10^6$ ,  $-2.376 \times 10^2$  (arbitrary, far-field)
- Reference Point Elevation: 1450 ft



The model input file is included in Appendix B. The appendix also includes graphs showing the model inputs and outputs (Figures B-1 and B-2). An electronic copy of the model input and output files (including model calibration files) is also attached.

#### **2.4.3 Model Sensitivity Analysis**

The model was run under two more hydraulic conductivities (155 and 255 ft/day) to test the model sensitivity to the hydraulic conductivity. The shape and extent of the groundwater stream lines were not significantly different from those of the calibrated model (hydraulic conductivity = 205 ft/day).

The electronic model input files for the sensitivity analysis are also attached.

#### **2.4.4 Surface Watershed Component**

Because the municipal wellfield is recharged by surface water, any area that readily contributes surface water to the 10-year modeled capture zone has been added to the WHPA. The surface watershed was determined by a review of the topographic map and was performed with input from the City of Windom, DNR, Cottonwood County, and MDH staff. The surface water component to the WHPA is detailed in Figure 5.

#### **2.4.5 Wellhead Protection Area**

The WPHA was delineated using MLAEM based on the 10-year capture zone of City Wells and the surface water component contributing to that area. The WHPA is shown on Figure 5.

3

This section documents the vulnerability assessments of the wells and drinking water supply management area for the public water supply system operated by the City of Windom. This assessment was performed in accordance with rules (Minnesota Rule 4720-5210) for preparing and implementing wellhead protection measures for public water supply wells.

### 3.1 WELL VULNERABILITY

The vulnerability of City wells was determined by evaluating available information on the geology and well construction.

- Based on a review of the local geology, there is no known condition that threatens well integrity.
- A review of logs (Appendix A) shows casing material identified in all but one well (Windom #3). Well construction information indicates that proper materials were installed and the construction is non-vulnerable.
- The MDH Well Vulnerability Assessments for each of the municipal wells were reviewed. It was determined that of the eight wells (Nos. 3A, 4, 5, 6, 7, 8, 9, and 10) only wells 5, 7, and 8 are considered vulnerable. The MDH has developed a database of community and non-community non-transient public water supply wells in Minnesota that stores information pertinent to well vulnerability and rates the vulnerability of individual wells. A score is calculated for each well based on factors such as well construction, geology at the well site and chemical data. Higher scores correlate to greater perceived vulnerability. A numeric cut-off is used to differentiate vulnerable from non-vulnerable wells (MDH, 1993). In certain cases, the system identifies vulnerable wells based on the presence of contamination

such as nitrate-nitrogen in excess of 10 mg/l, or young (post-1953) water as indicated by the presence of 1 tritium unit or greater in the well water. The results of this assessment for the above-mentioned City wells are described below. Printouts from the MDH vulnerability database are included in Appendix C.

City of Windom wells Nos. 5, 7, and 8 were determined to be relatively vulnerable to contamination from activities at the land surface. This evaluation is based on factors such as the geologic sensitivity at these sites. The geologic sensitivity of the surficial glacial outwash aquifer is high because no low-permeability materials, such as clay or till, that might slow the vertical migration of contaminants at the land surface overlie the majority of this site.

### **3.2 VULNERABILITY OF THE DRINKING WATER SUPPLY MANAGEMENT AREA**

The vulnerability of the DWSMA for the City of Windom was determined by evaluating available information on geologic materials overlying the aquifers and the groundwater flow model.

Delineation of the wellhead protection area includes two components 1) the portion of the outwash channel aquifer included in the capture zones for the city wells, and 2) the surface water runoff area that provides recharge to the outwash channel aquifer (Figure 5). The vulnerability of these two areas differs because the channel aquifer is not present in most of the surface water runoff area. Here, clay-rich glacial deposits are present and surface water does not readily move vertically to recharge groundwater resources. Therefore, the composition of the glacial deposits within the DWSMA was evaluated to determine where clay-rich versus highly permeable sediments occurred below the soil horizon.

The Cottonwood County soil survey was used to provide additional detail regarding the composition of the glacial deposits within the DWSMA. The MDNR has prepared geologic

sensitivity ratings for the soil classifications described in the county soil surveys that were prepared by the Natural Resources Conservation Service (formerly the U.S. Soil Conservation Service). The MDNR sensitivity ratings were applied to the soils present within the DWSMA to prepare the vulnerability assessment for 1) the well capture zone area, 2) the areas where the outwash channel aquifer is present beyond the capture zones, and 3) the surface water runoff area. The results are shown in Figures 6 and 7.

The vulnerability of the area where the outwash channel aquifer is present is designated high because there appears to be no laterally persistent layers of fine-grained geologic materials to retard or prevent the vertical movement of water-borne contaminants. Elsewhere, the vulnerability of the DWSMA is designated as low because clay-rich glacial deposits are the predominant sediment type. Sand and gravel bodies may occur within these deposits, but are likely to be very localized and not in direct contact with the outwash channel aquifer.

### **3.3 DELINEATION OF THE DRINKING WATER SUPPLY MANAGEMENT AREA**

The area encompassed by combining the boundaries of the well capture zones and the surface water runoff component defines the wellhead protection area. The purpose for designating the DWSMA is to provide the public with clear boundaries of the protection area. The DWSMA boundaries must match those of the wellhead protection area as closely as possible using the following identifiable features:

- Center lines of highways, streets, roads, or railroad right-of-ways;
- Section and quarter sectioning lines from the US Public Land Survey;
- Property or fence lines
- The center of public drainage systems;
- Public utility service lines; or
- Political boundaries.

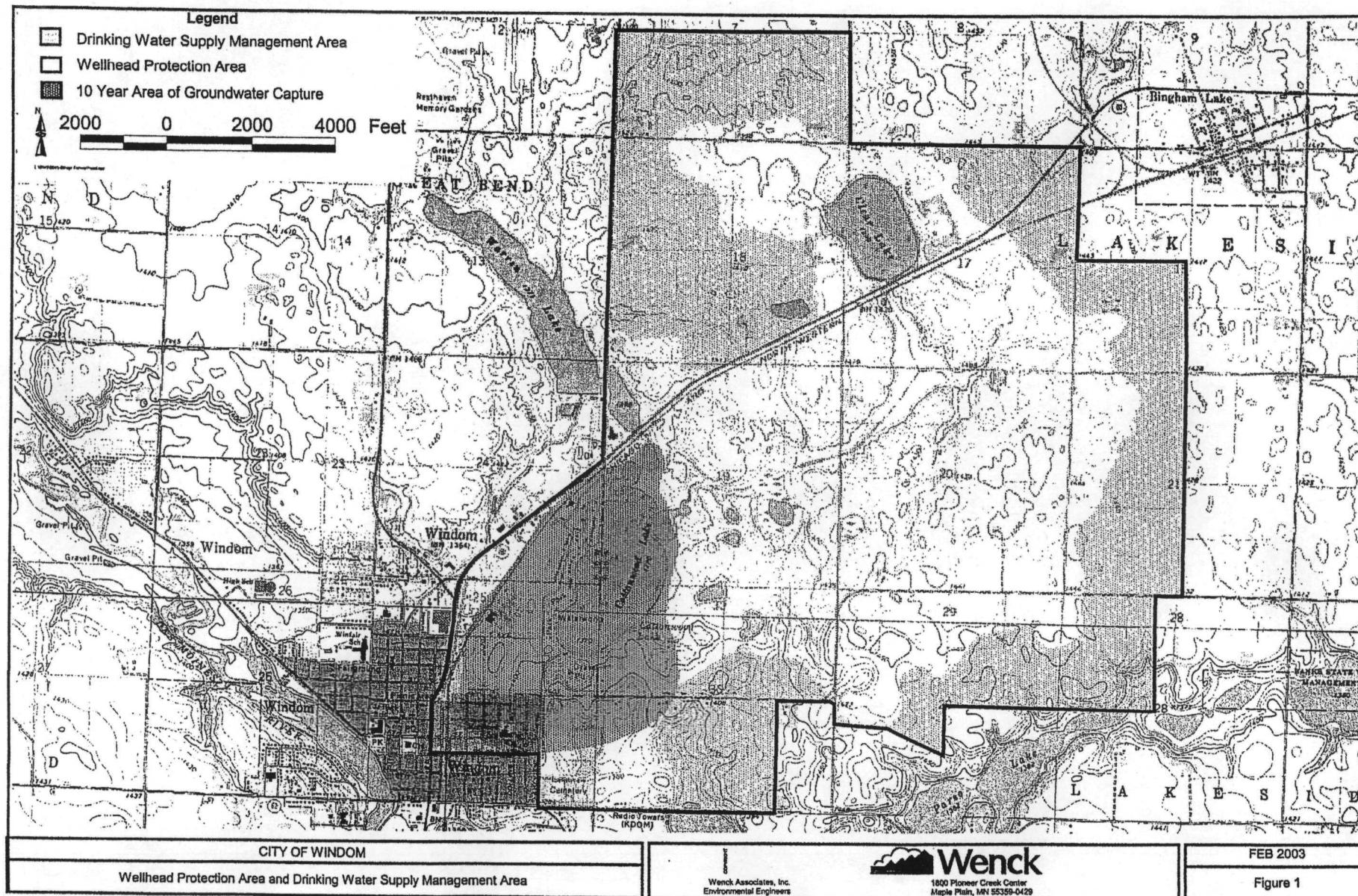
City staff assisted with defining the boundaries for the DWSMA. The DWSMA incorporates all properties that were partially or completely within the WHPA. The DWSMA is shown in Figure 1.

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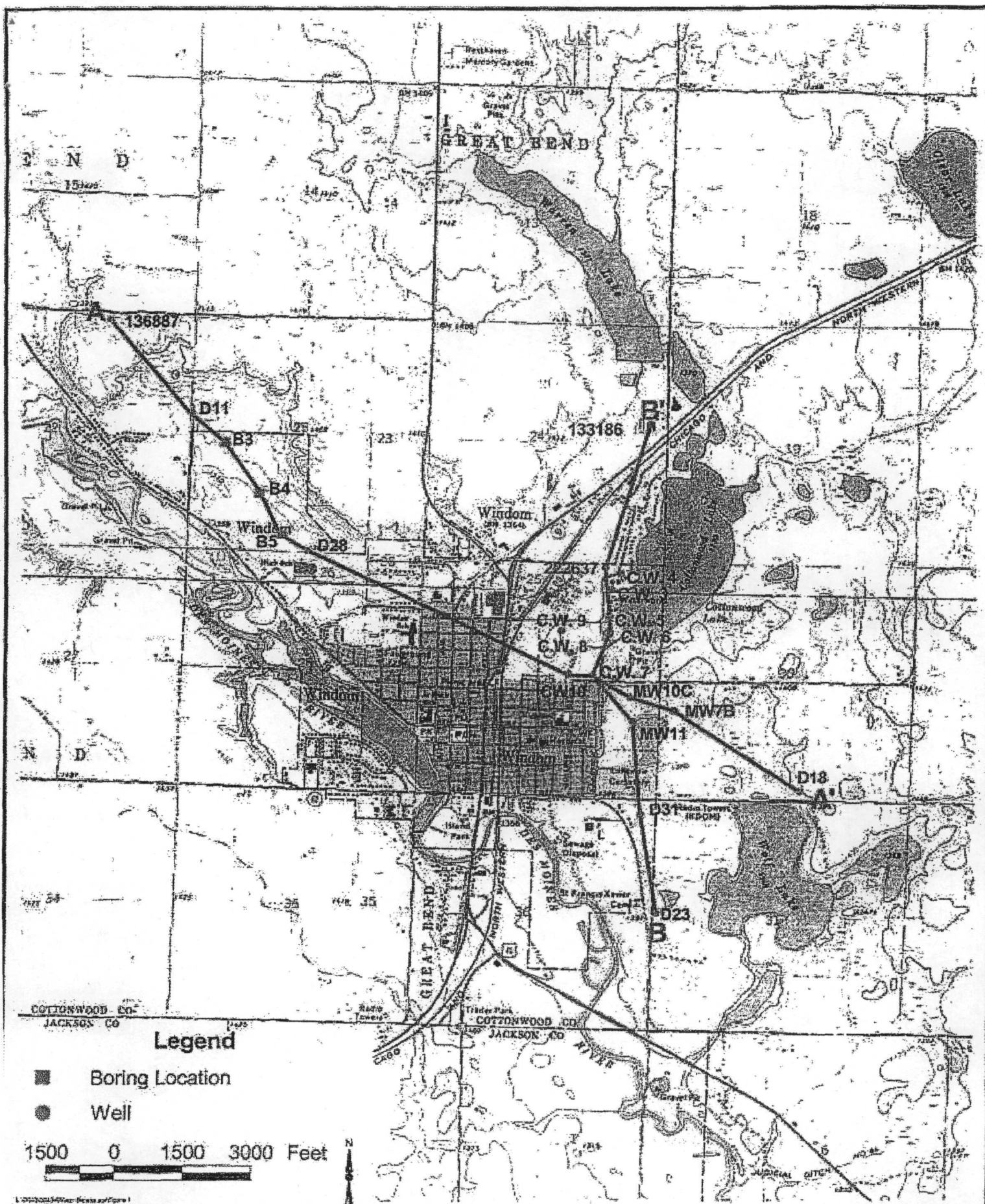
## 4.0 References

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CONSULT

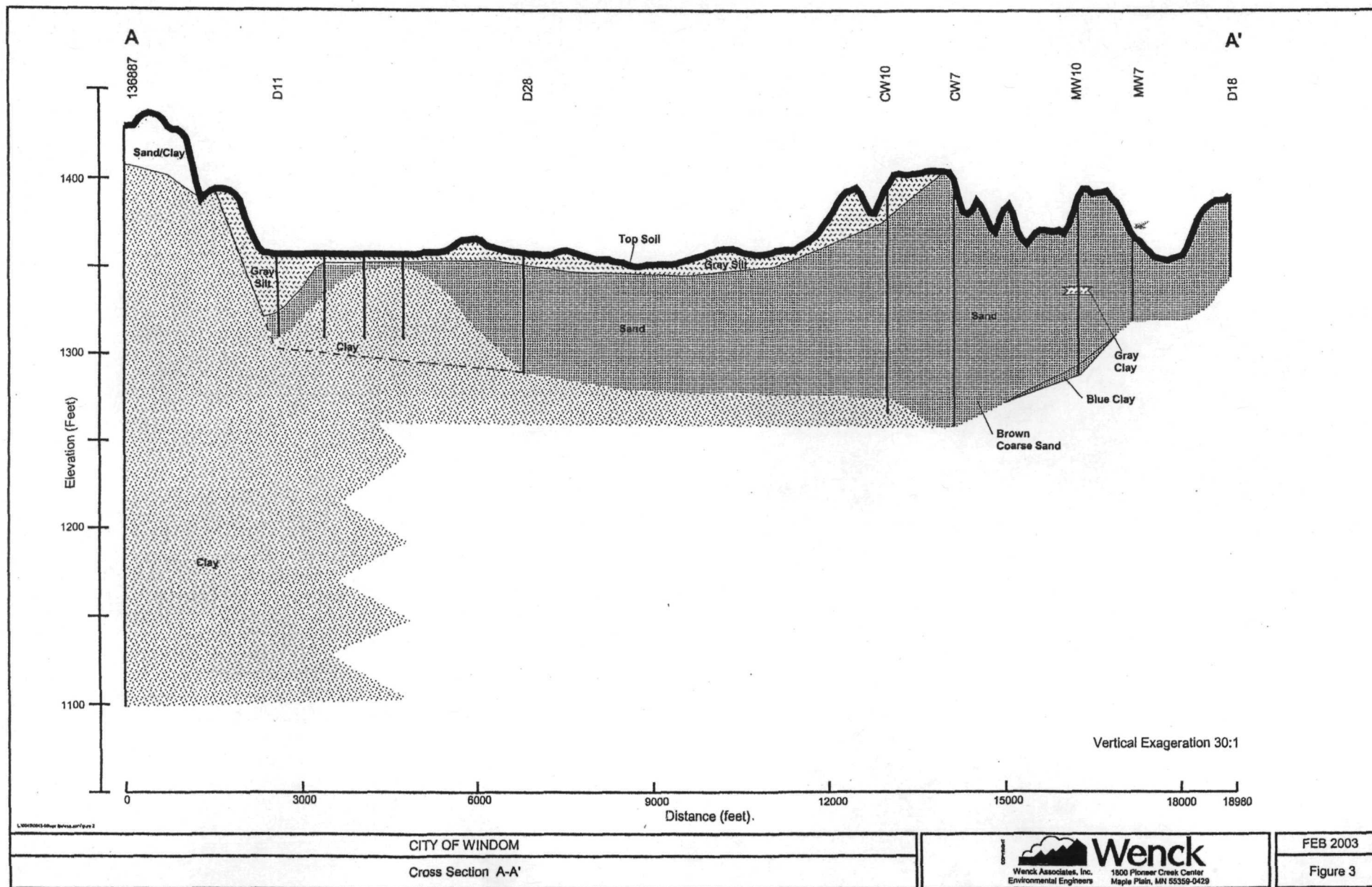


**Wenck**

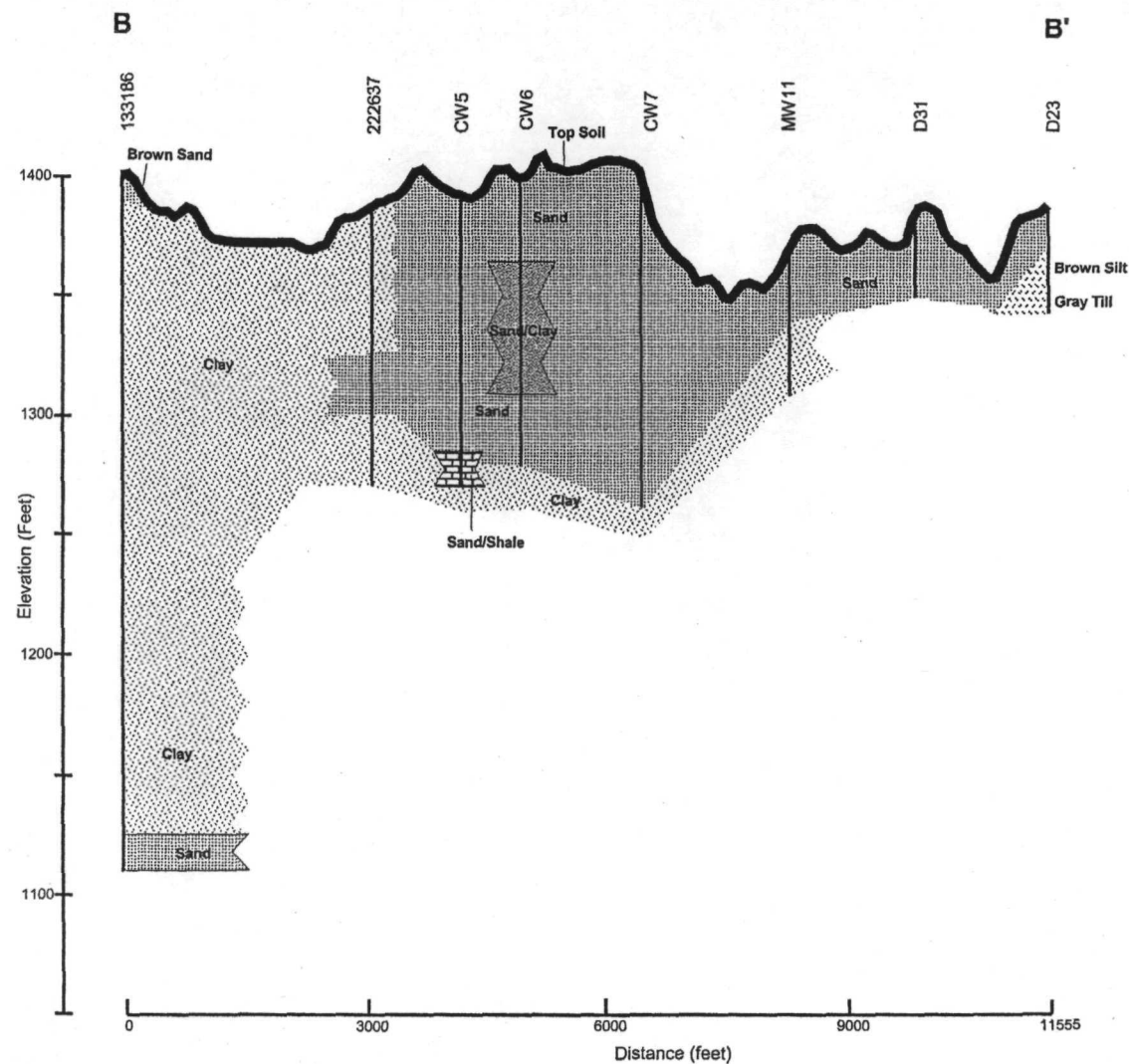
Wenck Associates, Inc. 1800 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN 55359-0429

FEB 2003

Figure 2







Vertical Exageration 30:1

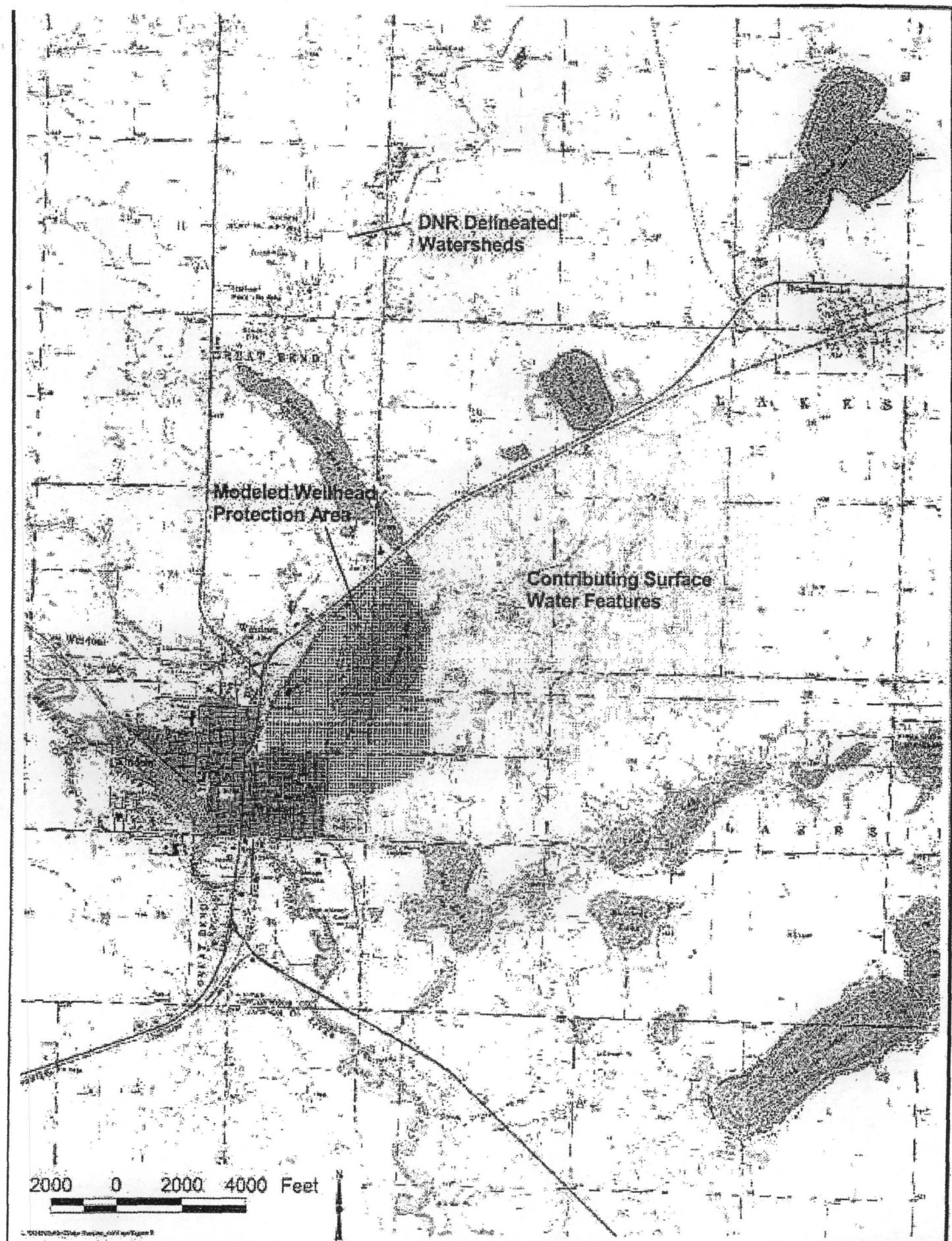
CITY OF WINDOM

Cross Section B-B'

**Wenck**  
 Wenck Associates, Inc.  
 Environmental Engineers  
 1800 Pioneer Creek Center  
 Maple Plain, MN 55359-0429

FEB 2003

Figure 4



CITY OF WINDOM

10-Year Groundwater Capture Area and  
Contributing Surface Water Features

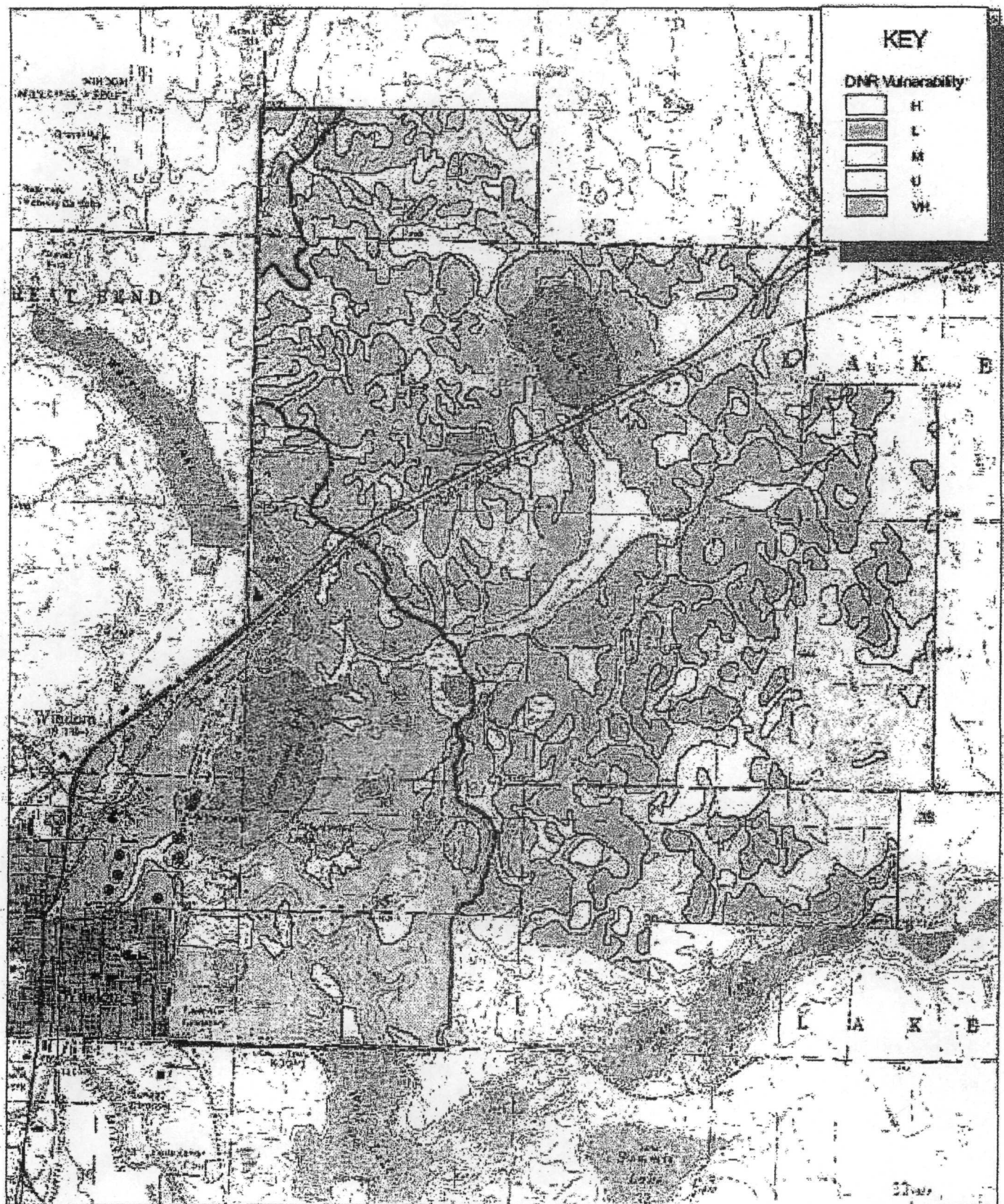


**Wenck**

Wenck Associates, Inc. 1600 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN 55356-9429

FEB 2003

Figure 5



City of Windom

DNR Vulnerability Ratings Taken From County Soil Survey



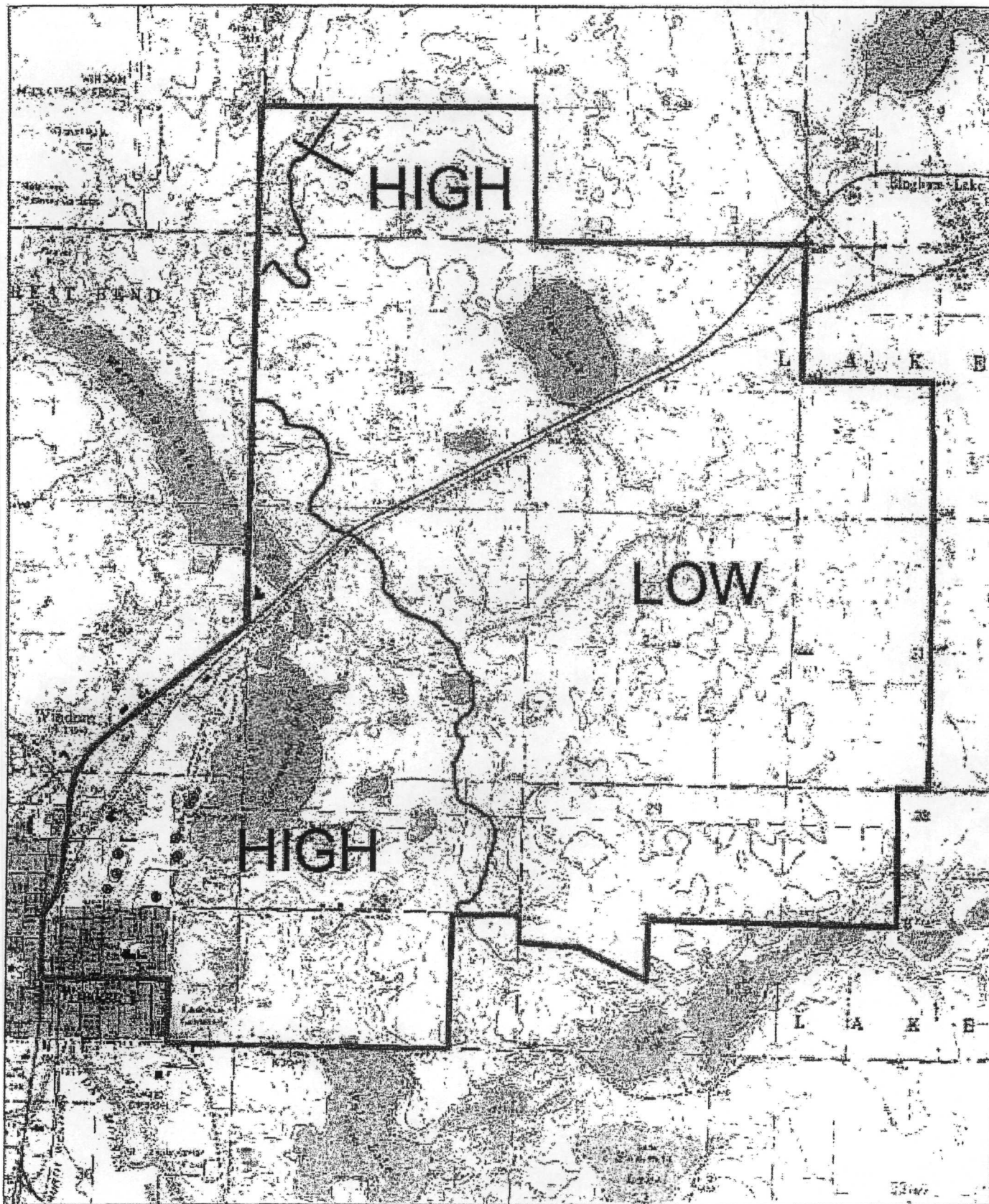
**Wenck**

Wenck Associates, Inc. 1800 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN. 55359

February 2003

Figure 6





City of Windom

Vulnerability of the Drinking Water Supply Management Area



**Wenck**

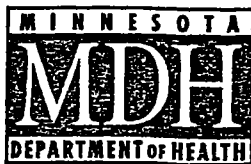
Wenck Associates, Inc. 1800 Pioneer Creek Center  
Environmental Engineers Maple Plain, MN 55359

February 2003

Figure 7

**EXHIBIT #D**

**MDH SECOND SCOPING LETTER  
AUGUST 13, 2003**



*Protecting, maintaining and improving the health of all Minnesotans*

August 13, 2003

Mr. Dennis Nelson, Administrator  
City of Windom  
444 Ninth Street  
P.O. Box 38  
Windom, Minnesota 56101-0038

Dear Mr. Nelson:

I am writing to provide notice of our findings of the July 14, 2003, second scoping meeting held to determine the data elements that are to be used to develop the remainder of the wellhead protection (WHP) plan for the city of Windom public water supply system. I am pleased that the city of Windom is proceeding with the preparation of the a WHP plan following the department's approval of the delineated WHP area, drinking water supply management area (DWSMA), and well and aquifer vulnerability assessments for your wells (Unique Well Nos. 232447, 232448, 222652, 222651, 132251, 490926, 595769 and 603837).

I would like to remind you of the need to submit a copy of your Minnesota Department of Health (MDH) approved WHP area delineation, DWSMA, and vulnerability assessments to local units of government and any watershed districts and/or watershed management organizations that may be wholly or partly within the DWSMA.

The remainder of this letter will focus on the data elements the city of Windom must collect and use to prepare the remainder of its WHP plan. The information requested should be as specific as possible to the DWSMA. Further, if the data being requested does not exist, please include a statement to that affect in your WHP plan. I will address each of the data elements identified in Minnesota Rules, part 4720.5400.

**DATA ELEMENTS**  
(Minnesota Rules, part 4720.5400, subparts 2-5)

**I. PHYSICAL ENVIRONMENT**

**A. PRECIPITATION**

1. An existing map or list of local precipitation gauging stations and an existing table showing the average monthly and annual precipitation in inches for the preceding five years.

These data elements need to be included in the remainder of your WHP plan. A brief discussion regarding how precipitation may impact the highly vulnerable portions of the DWSMA should be included.

**B. GEOLOGY**

1. **A map and a description of the geology, including important aquifers, confining layers, recharge areas, discharge areas, sensitive areas, and groundwater flow characteristics.**

This data element was included with the first part of the WHP plan so it does not need to be included again. However, you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies.

2. **Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations.**

This data element was included with the first part of the WHP plan so it does not need to be included again.

3. **Existing boreholes, geophysical records from wells, borings, and exploration test holes.**

This data element was included with the first part of the WHP plan so it does not need to be included again.

4. **Existing surface geophysical studies.**

This data element was included with the first part of the WHP plan so it does not need to be included again. However, you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies.

**C. SOILS**

1. **An existing map of the soils and a description of soils infiltration characteristics and a description or map where eroding lands are causing sedimentation problems.**

A discussion of this data element must be included in the remainder of your WHP plan. You must describe how this information will impact the management of the highly vulnerable portions of the DWSMA, and use it to select appropriate management strategies.

**D. WATER RESOURCES**

1. **A map of the boundaries and flow directions of watershed units and minor watershed units.**

This data element needs to be included in the remainder of your WHP plan. You must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies. The Cottonwood County Soil and Water Conservation District or environmental services office should be able to provide this information for you.

2. **The following maps are required in the remainder of the plan:**

- a. **An existing map of shoreland areas and their shoreland classification under Minnesota Statutes, Sections 103G and 103F, and pursuant to part 6120.3000 and public drainage ditches.**
- b. **An existing map showing those areas delineated as flood plain by existing local ordinances.**
- c. **An existing map of wetlands regulated under Chapter 8420 and Minnesota Statutes, Sections 103G.221 to 103G.2373.**
- d. **An existing map and list of public waters as defined in Minnesota Statutes, Section 103G.005, subdivision 15, and public drainage ditches.**

If these data elements exist, they must be included in the remainder of your WHP plan. You must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies. The Cottonwood County Planning and Zoning Office and Soil and Water Conservation office should be able to provide this information for you.

**II. LAND USE**

**A. LAND USE**

1. **An existing map of parcel boundaries, political boundaries, and public land survey.**

This data element must be included in your WHP plan and you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies.

2. **A map and inventory of the current and historical agriculture, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.**



This data element is very important and must be included in the WHP plan. The identification of current and historical land uses which identify potential contaminant sources within the DWSMA must be included in the remainder of your WHP plan. The city will need to inventory wells, storage tanks, and shallow disposal wells throughout the DWSMA. The inventory, mapping, and management of land uses and potential sources of contamination within the DWSMA must reflect what is known about this data element as follows:

- **Low vulnerability areas within the DWSMA** - Wells, automotive disposal systems, large individual sewer systems serving more than 20 people or two or more facilities, and cesspools.
- **Highly vulnerability areas within the DWSMA** - A wide variety of potential contaminant sources need to be inventoried, including hazardous waste generators or disposal sites, dumps, septic systems, storage tanks, agriculturally associated land uses, pipelines, transportation networks, spill sites, leaking tank sites, and other types of land uses that may contribute contaminants to the groundwater within the DWSMA. In addition, wells, automotive disposal systems, large individual sewer systems serving more than 20 people or two or more facilities, cesspools, and storage tanks must be identified.

As a starting point, MDH will provide a list of specific potential sources of contamination from state data bases and a list of categories of potential sources of contamination that help identify what is meant by "potential sources of contamination." The city of Windom will have to research other possible sources to augment this data. All parcels of land that contain an identified potential source of contamination must be identified with an identification number as assigned by the county auditor pursuant to Minnesota Statutes 272.193.

The plan must include any state identifiers, if available, that have been assigned to a specific source of contamination. MDH will contact the various state agencies to provide this information for you. Maps and data collected must be recorded and reported to the MDH as per Minnesota Rules, part 4720.5500. Please refer to *Minnesota Rules, parts 4720.5100 to 4720.5590, Guidance Pertaining to Wellhead Protection Requirements For Public Water Supply Wells, December 1997*, specifically Data Reporting Requirements (page 11) and Chapter 5, Preparing a Plan of Action to Manage Potential Contaminant Sources (page 21), for additional detail and references to the rule.

### **3. An existing comprehensive land-use map and zoning map.**

This city information must be included in the remainder of your WHP plan; and you must describe how this information will impact or influence the management of the DWSMA and use it to select appropriate management strategies. The city will need to include a zoning and comprehensive plan map for that area of the DWSMA that lies within the municipal boundaries and any designated growth areas. County planning and zoning information must also be included in the remainder of your WHP plan; and you must describe how this information will impact the management of the DWSMA. Data collected under this data element must be used to select appropriate management strategies.

## **B. PUBLIC UTILITY**

- 1. Maps of transportation routes or corridors; storm sewers; sanitary sewers; public water supply systems; gas and oil pipelines as used by gas and oil suppliers; public drainage systems (or list); and record of construction, maintenance, and use of public water supply wells and other wells within the DWSMA.**

These data items must be included in the remainder of the WHP plan. MDH will provide construction records of your wells. You must include a map indicating where pipelines, major highways, or public drainage systems occur within the highly vulnerable portions of a DWSMA. An inventory of all known wells within the DWSMA must be conducted and illustrated on a map. MDH will provide an initial inventory of wells from existing data bases. The city will have to verify the accuracy of this data and revise as needed. It is not necessary to include a map of your public water supply system in your plan if you feel it would pose a threat to the security of the system. As stated earlier, an inventory of all known wells within the DWSMA must be conducted and illustrated on a map. You must describe how this collected information may impact the management of the DWSMA and how this information will be used in developing management strategies.

## **III. WATER QUANTITY**

### **A. SURFACE WATER**

- 1. An existing list of descriptions of high, mean, and low flows on streams; an existing list of those streams for which protected levels or flows have been established; an existing list of permitted withdrawals from streams including source, use, and amounts withdrawn; and an existing description of known water-use conflicts, including those caused by groundwater pumping.**

If this information exists, it must be included in the remainder of your WHP plan; and you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies. The MDH can provide assistance, if requested, in gathering any existing information regarding stream flows, water-use conflicts, and withdrawals.

### **B. GROUNDWATER**

- 1. An existing list of any wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source; any existing description of known well interference problems and water use conflicts; and any existing lists of state environmental bore holes, including unique well number, aquifer measured, years of record, and monthly levels.**

If this data exists, it must be included in the remainder of your WHP plan; and you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies. MDH will provide this information.

Mr. Dennis Nelson  
Page 6  
August 13, 2003

#### **IV. WATER QUALITY**

##### **A. SURFACE WATER**

- 1. Existing map or list of the state water quality management classification for each stream and existing summaries of stream water quality monitoring data.**

If this data exists, it must be included in the remainder of your WHP plan; and you must describe how this information will impact the management of the DWSMA, and use it to select appropriate management strategies. MDH can provide help in obtaining this information. Monitoring data should include bacteriological contamination indicators, inorganic and organic chemicals, sedimentation, dissolved oxygen, and excessive growth or deficiency of aquatic plants.


##### **B. GROUNDWATER**

- 1. Existing summaries of water quality data, including bacteriological contamination indicators, and inorganic and organic chemicals; existing lists of water chemistry and isotopic data from wells, springs, or other groundwater sampling points; and any reports of groundwater tracer studies, existing site studies and well water analysis of known areas of groundwater contamination, existing property audit identifying contamination, and any reports to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.**

If this data exists, it must be included in the remainder of your WHP plan; and you must describe how this information regarding water resources will impact the management of the DWSMA, and use it to select appropriate management strategies. The MDH will provide you with a list of known contaminant spills or releases from existing Minnesota Department of Agriculture or Minnesota Pollution Control Agency records. Information gathered under this data element applies only to the highly vulnerable portions of the DWSMA.

In closing, the MDH is very pleased to see the city of Windom moving forward to complete its WHP plan, and we will be happy to assist you with this. If you have any questions regarding this letter, please contact me at (507) 389-6597.

Sincerely,



Terry L. Bovee, Planner  
Environmental Health Division  
Suite 500, Nichols Office Center  
410 Jackson Street  
Mankato, Minnesota 56001

TLB:tvw

bcc: Chuck Regan, Minnesota Pollution Control Agency  
Brian Williams, Minnesota Department of Agriculture  
Brian Rongitsch, Minnesota Department of Natural Resources  
Eric Mohring, Board of Water and Soil Resources

Robyn Hoerr, Minnesota Rural Water Association

## SCOPING DECISION NOTICE NO. 2

### > Remainder of the Wellhead Protection Plan

Name of Public Water Supply: City of Windom - PWSID 1170006		Date: Aug. 12, 2003
Name of the Wellhead Protection Manager: Mr. Dennis Nelson, Administrator, City of Windom		
Address: 444 - 9 <sup>th</sup> Street	City: Windom	Zip: 56101-0038
Unique Well Numbers: 232447 (Well 3A), 232448 (Well 4), 222652 (Well 5), 222651 (Well 6), 132251 (Well 7), 490926 (Well 8), 595769 (Well 9), 603837 (Well 10).		Phone: 507-831-6129

### Instructions for Completing the Scoping No. 2 Form

N	R	S	N = Not required. If this box is checked, this data element is NOT necessary for your wellhead protection plan because it is not needed or it has been included in the first scoping decision notice. Please go to the next data element.
X			

N	R	S	R = Required for the remainder of the plan. If this box is checked, this data MUST be used for the "remainder of the plan."
	X		

N	R	S	S = Submit to MDH. If this box is checked, this data element MUST be included in your wellhead protection plan and submitted to MDH. If there is NO check mark in the "S" box but there is an "x" in the "R" box, this data element MUST be included in your plan, but should NOT be submitted to MDH. This box will only be checked if MDH does not have access to this data element. This will help to reduce the cost by reducing the amount of paper and time to reproduce the data element.
		X	

**Note: Any data elements required in the first scoping decision notice must also be used to complete the remainder of the wellhead protection plan.**

## DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

PRECIPITATION			
N	R	S	An existing map or list of local precipitation gauging stations.
	X	X	
<b>Technical Assistance Comments:</b> The management of the Drinking Water Supply Management Area (DWSMA) must reflect what is known about this data element.			
N	R	S	An existing table showing the average monthly and annual precipitation in inches for the preceding five years.
	X	X	
<b>Technical Assistance Comments:</b> A brief discussion of how precipitation may infiltrate into regional aquifers at different rates based on soil and geologic conditions is useful in establishing suitable management strategies for the highly vulnerable portions of DWSMA.			
GEOLOGY			
N	R	S	An existing geologic map and a description of the geology, including aquifers, confining layers, recharge areas, discharge areas, sensitive areas as defined in Minnesota Statutes, section 103H.005, subdivision 13, and groundwater flow characteristics.
	X		
<b>Technical Assistance Comments:</b> Although this information was discussed in Part 1, a brief discussion of the geology within the DWSMA is useful in developing management strategies.			
N	R	S	Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.
	X		
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about these data elements.			
N	R	S	Existing borehole geophysical records from wells, borings, and exploration test holes.
	X		
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect the geology of the areas.			
N	R	S	Existing surface geophysical studies.
	X		
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect the geology of the areas.			
SOILS			
N	R	S	Existing maps of the soils and a description of soil infiltration characteristics.
	X	X	
<b>Technical Assistance Comments:</b> A brief discussion should be included in the Part 2 report to address the role soils may play in allowing precipitation or possibly contaminants to infiltrate into the aquifer within the highly vulnerable portion of the DWSMA. The local USDA Natural Resource Conservation Service office should be able to provide this information.			
N	R	S	A description or an existing map of known eroding lands that are causing sedimentation problems.
	X	X	
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.			

WATER RESOURCES			
N	R	S	An existing map of the boundaries and flow directions of major watershed units and minor watershed units.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	The shoreland classifications of the public waters listed under subitem (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map of wetlands regulated under Chapter 8420 and Minnesota Statutes, section 103G.221 to 103G.2373.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map showing those areas delineated as floodplain by existing local ordinances.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			

## DATA ELEMENTS ABOUT THE LAND USE

LAND USE			
N	R	S	An existing map of parcel boundaries.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map of political boundaries.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Areas must reflect what is known this about data element.			
N	R	S	An existing map of public land surveys including township, range, and section.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			



N	R	S	A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.
	X	X	
<p><b>Technical Assistance Comments:</b> The inventory, mapping and management of land uses and potential sources of contamination for the DWSMA must reflect what is known about this data element as follows:</p> <p>Low vulnerability outside the groundwater capture zone - Wells, automotive disposal systems, sewer systems serving more than 20 people or 2 or more facilities, cesspools, tanks, all non point potential sources of contamination.</p> <p>High vulnerability within the groundwater capture zone - Wells, automotive disposal systems, sewer systems serving more than 20 people or 2 or more facilities, cesspools and other forms of potential contaminant sources and land uses.</p> <p>High vulnerability outside the groundwater capture zone - Wells, automotive disposal systems, sewer systems serving more than 20 people or 2 or more facilities, cesspools and all point and non-point potential sources of contamination and associated land uses.</p> <p>As a starting point, MDH provided a list of specific potential sources of contamination from State data bases and a list of categories of potential sources of contamination that helps identify what is meant by "all potential sources of contamination."</p>			
N	R	S	An existing comprehensive land-use map.
	X	X	
<p><b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.</p>			
N	R	S	Existing zoning map.
	X	X	
<p><b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.</p>			

# PUBLIC UTILITY SERVICES

N	R	S	An existing map of transportation routes or corridors.
	X	X	
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map of storm sewers, sanitary sewers, and public water supply systems.
	X		
<b>Technical Assistance Comments:</b> It is not necessary to include a map of your public water supply system in your plan, if you feel it would pose a threat to the security of your system. An existing map of the storm sewers and sanitary sewers in the DWSMA must be included in the wellhead protection plan and must also be submitted to the MDH as part of the approval.			
N	R	S	An existing map of the gas and oil pipelines used by gas and oil suppliers.
	X	X	
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing map or list of public drainage systems.
	X	X	
<b>Technical Assistance Comments:</b> The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing record of construction, maintenance, and use of the public water supply well and other wells within the drinking water supply management area.
	X		
<b>Technical Assistance Comments:</b> MDH will provide an initial inventory of wells within the DWSMA from existing data bases. City will have to verify accuracy of data and locations and use information to develop management strategies as appropriate for this data element.			

## DATA ELEMENTS ABOUT WATER QUANTITY

SURFACE WATER QUANTITY			
N	R	S	An existing description of high, mean, and low flows on streams.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing list of lakes where the state has established ordinary high water marks.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing list of lakes and streams for which state protected levels or flows have been established.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing description of known water-use conflicts, including those caused by groundwater pumping.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
GROUNDWATER QUANTITY			
N	R	S	An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing description of known well interference problems and water use conflicts.
	X	X	
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			
N	R	S	An existing list of state environmental bore holes, including unique well number, aquifer measured, years of record, and average monthly levels.
	X		
Technical Assistance Comments: The management of the DWSMA must reflect what is known about this data element.			

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## **Attachment 4**

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### **City of Windom Wellhead Protection Plan**